ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

JULY 1952

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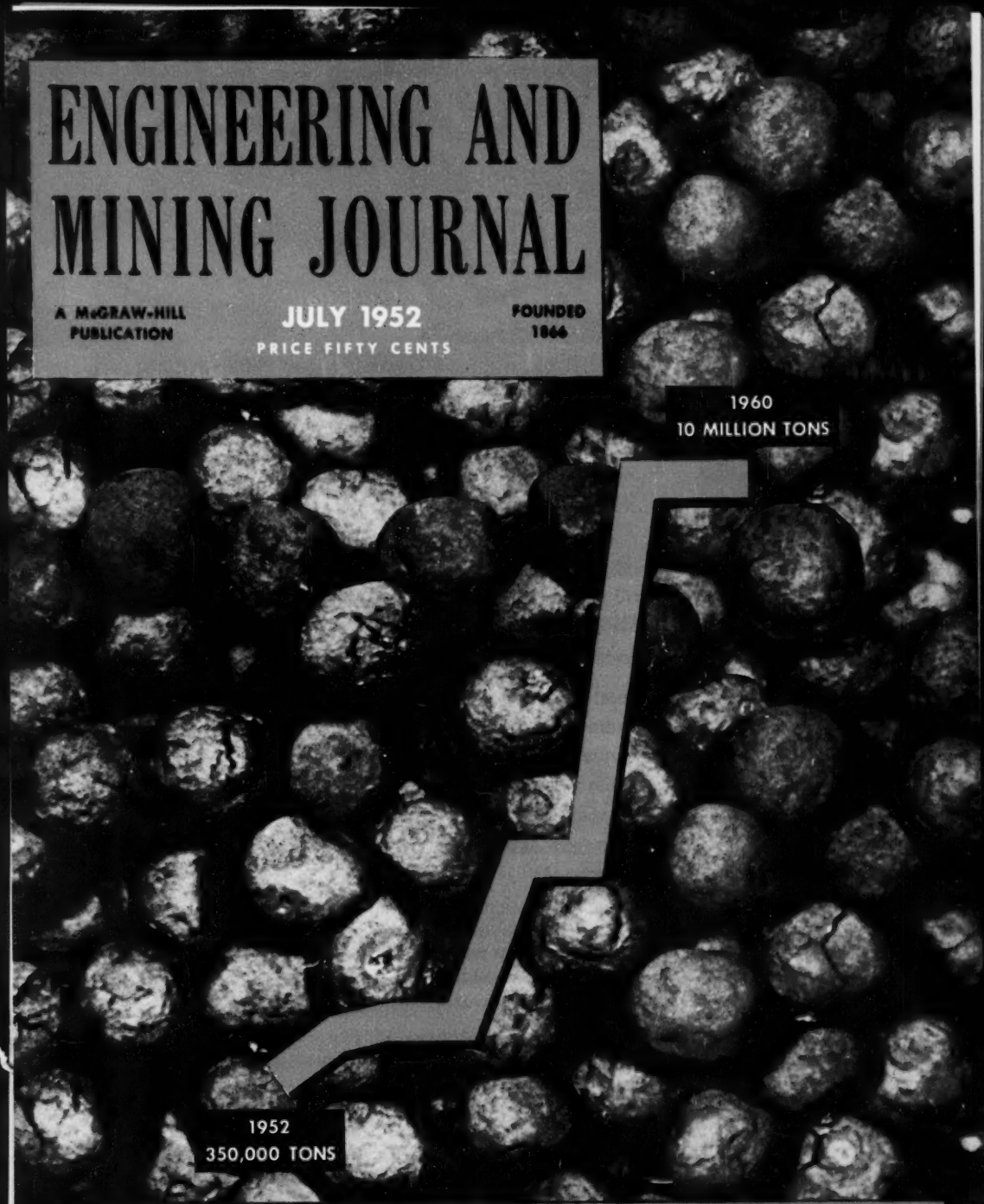
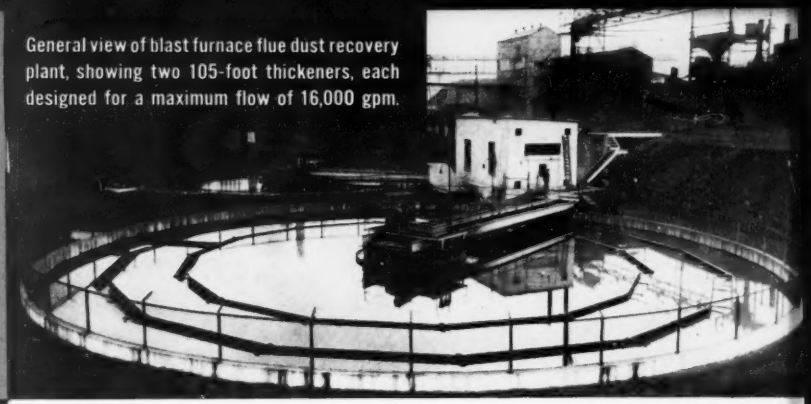
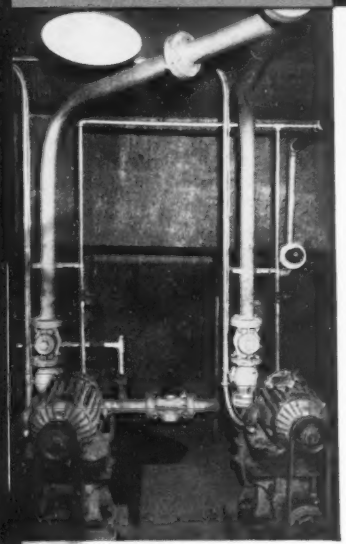


Commercial Taconite Is on the Way... p.72

The FLUE DUST



General view of blast furnace flue dust recovery plant, showing two 105-foot thickeners, each designed for a maximum flow of 16,000 gpm.



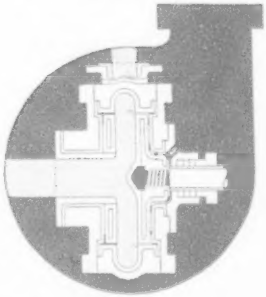
Two Hydroseal Slurry Pumps in tunnel under the thickener. One is a standby.

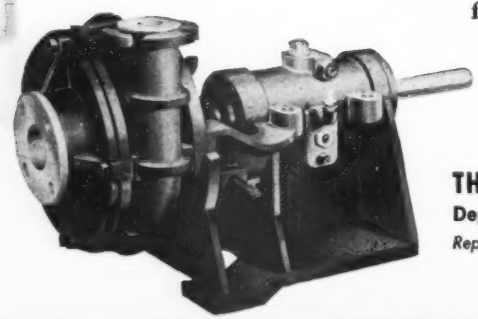
that doesn't get away

Hydroseal Pumps are helping to recover the flue dust in the Jones & Laughlin Steel Corp. plant at Aliquippa, Pennsylvania. This dust, which is about 60 percent iron, becomes a welcome addition to the blast furnaces after it has been filtered and sintered. As much as 100 tons of dust can be handled per day.

Located in tunnels under the two large thickeners, Hydroseal Slurry Pumps take the sludge from the hopper in the center of the thickeners, and deliver it to the receiver house. In this, as in all operations demanding maximum economy in abrasives handling, Hydroseals are the across-the-board favorites of engineers.

Let us help you with your pumping problem . . . write for Catalog No. 451.



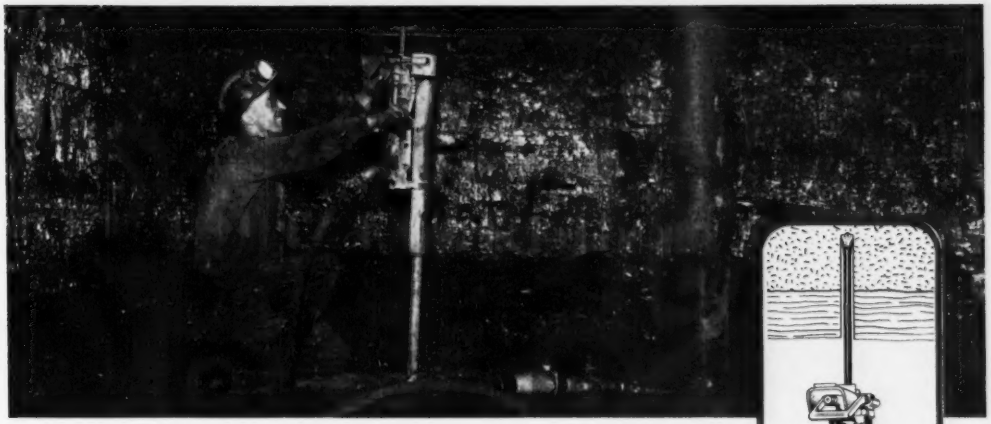


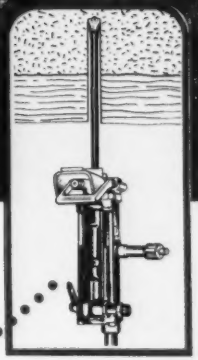
THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.
Representatives in Most Principal Cities

HYDROSEAL SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

HYDROSEAL PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

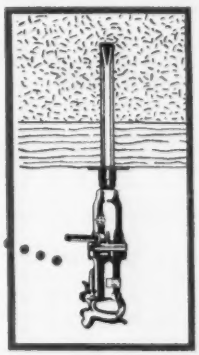
for "LOW OVERHEAD" in
ROOF BOLTING





do the *whole job* quicker and easier, with this three-way Ingersoll-Rand ROOF BOLTING COMBINATION

RP-38 "SHORT-LEG" STOPER, for drilling bolt holes and driving wedge type roof bolts. The light weight and excellent balance of this ultra-compact stoper permit easy handling in seams as low as three feet. It has positive, automatic rotation for fast bolt-hole drilling and plenty of power for driving the bolts into the hole. For extra-heavy drilling, the slightly larger Model RP-48 Stoper can be used.



SIZE 534 IMPACT WRENCH, for tightening and locking the roof bolts. This heavy-duty air powered tool gives a far greater torque impact than any other portable wrench of its size and weight. Extra deep sockets are available to permit tightening nuts over extended bolt ends.

CARSET JACKBITS, for faster, easier drilling in any type of ground. These bits, with super-hard tungsten carbide cutting edges, practically eliminate bit changing—have no appreciable gauge wear, increase drilling speed 50% or more. Steel bits available where needed.

Ask your I-R representative for complete information on this service-proved Ingersoll-Rand Roof Bolting Combination.

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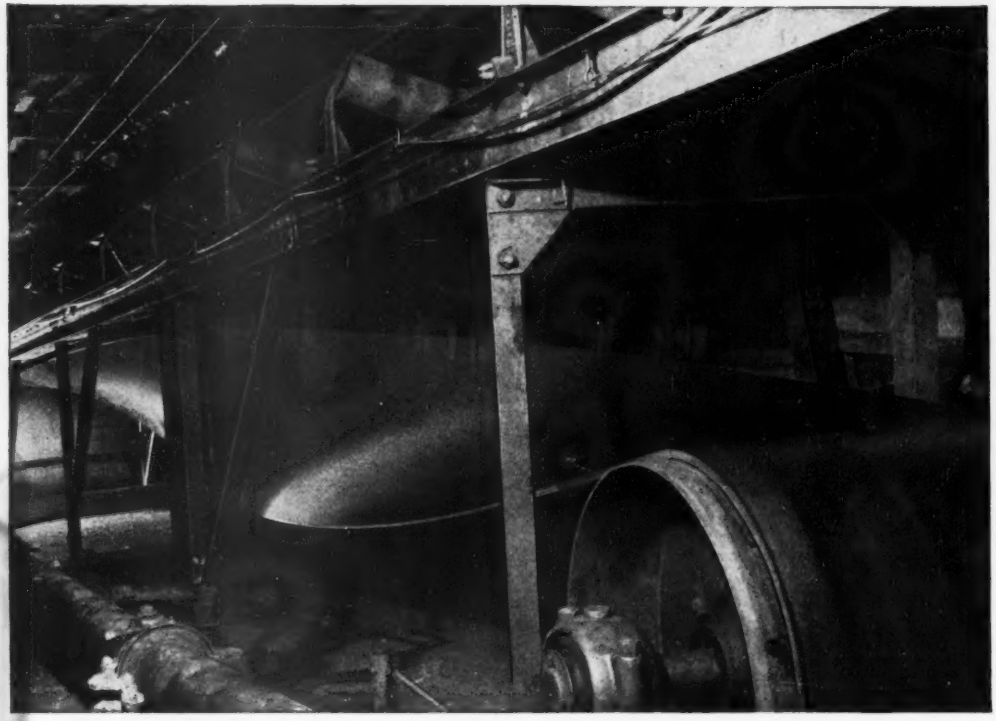
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



New "Turnover" belt system announced by B. F. Goodrich

Carries sticky, freezing, or corrosive material without belt damage

OPERATING nearly half a mile underground, this conveyor belt carries iron ore through a long, narrow mine tunnel. But sticky ore, combined with mine dampness, would cause belts to wear out fast. Wet, sticky particles would cling to the cover, build up into gummy layers, soon clog the return idlers and pulleys, finally damage the belt cover.

Then, last year, a B. F. Goodrich "Turnover" belt system was installed, and for the first time a steady stream of iron poured out of this mine without any costly shutdowns for belt repairs.

You can see how this new conveyor system works. As the ore is dumped off the end of the moving belt, the belt makes a 180° turn, runs empty along the return idlers, then makes another one-half turn before receiving the next load.

Only the clean side of the belt touches the idlers, so there's no chance for sticky or corrosive materials to build up on them. Even wet materials can be handled at sub-zero temperatures without danger of belt freezing to the rotating metal parts.

With the B. F. Goodrich "Turnover" belt, clean up of spillage is greatly reduced because any material that falls on the lower run of the belt is carried to the end and dumped off when the belt makes its turn. Damage to belt body is reduced because lumps of material cannot be trapped between the belt and pulleys.

Industry will find many other uses for the new B. F. Goodrich "Turnover" belt — in sugar refineries, fertilizer plants, limestone quarries — everywhere that sticky, freezing or corrosive materials must be moved from place to place. It's easy to convert any conventional system into the turnover type. Your local BFG distributor can show you how the "Turnover" belt can save you money, or write: *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.* (Available in Canada)

Conveyor Belts BY
B.F.Goodrich
RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

VOLUME 153 — 86th YEAR OF PUBLICATION — NUMBER 7

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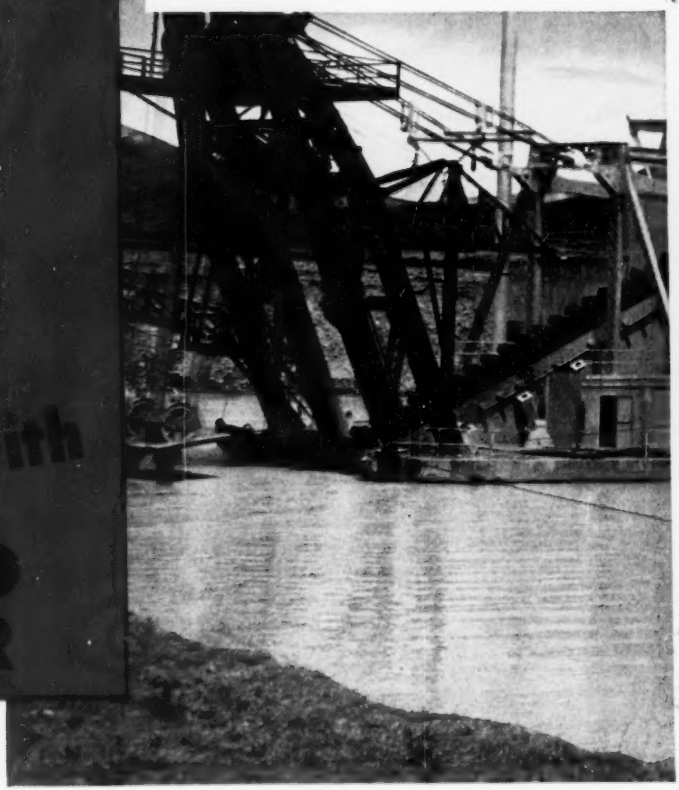
protect it with TEXACO CRATER

Even when wire rope is in and out of water continually, you'll find it *stays strong longer* when protected by *Texaco Crater.* That's because this penetrating lubricant *gets right into* the rope . . . coats each metal strand with an enduring protective film against wear and rust. At the same time, *Texaco Crater* adds life to the hemp core. It's tops as a maintenance cost reducer.

On open gears, too, *Texaco Crater* is the ideal lubricant. Its tough, long-lasting film



TEXACO

TEXACO

muffles noise, reduces wear and maintenance costs. Your gears last longer.

If you prefer the added convenience of fluid application, use *Texaco Crater X Fluid*. It's the same high quality lubricant designed to *go* on as a liquid and *stay* on as a tough, protective coating that lasts and lasts.

In all types of mine car wheel bearings, use *Texaco Olympian Grease* – the all-year lubricant that assures easier starts, smoother operation, lower maintenance costs.

A Texaco Lubrication Engineer will gladly show you how these and other Texaco mining lubricants can reduce your machinery maintenance costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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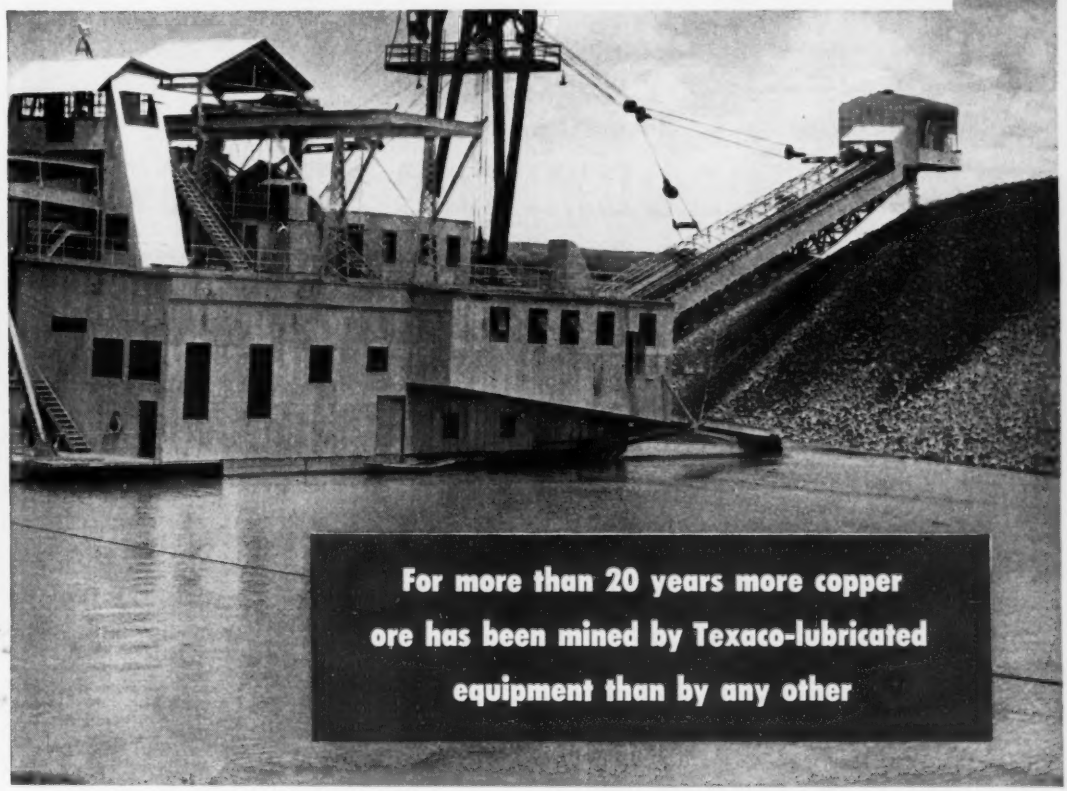
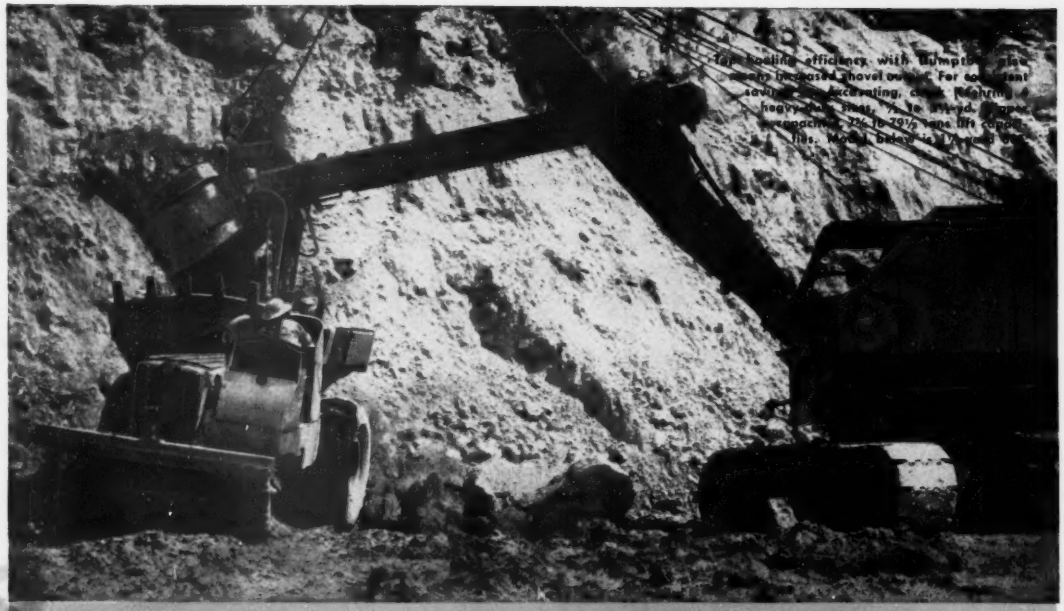
The Texas Company, 135 East 42nd Street, New York 17, N. Y.



Lubricants and Fuels
FOR THE MINING INDUSTRY

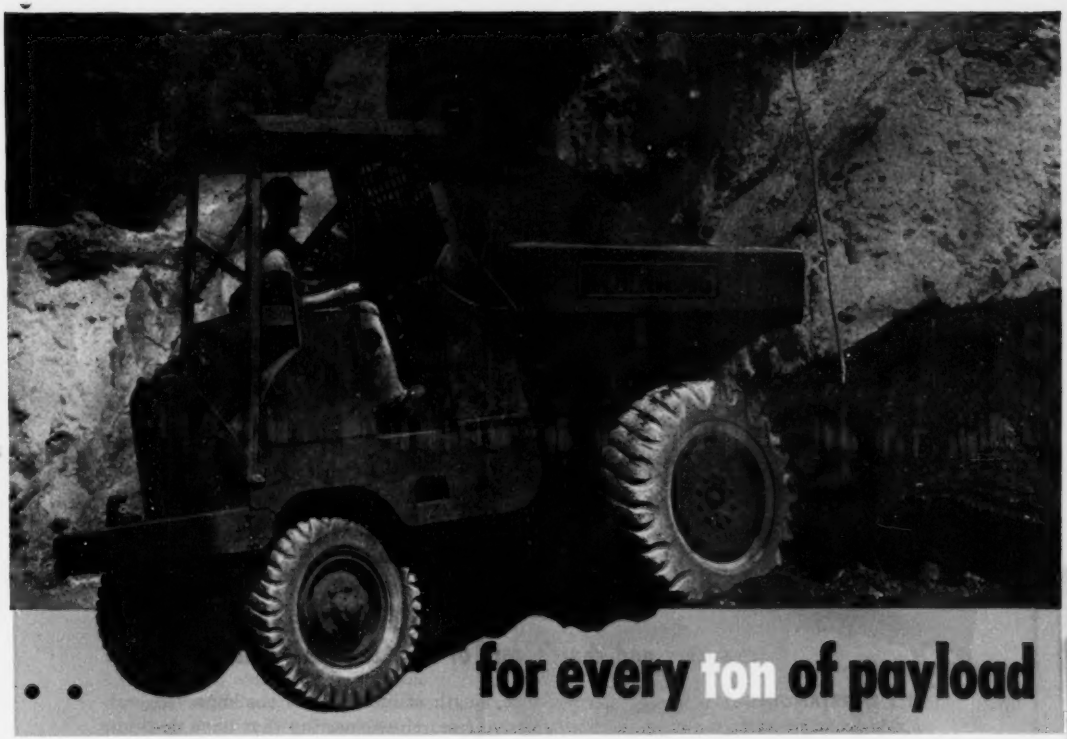
Faithfully yours 50 TEXACO *for Fifty Years*



A TON OF DUMPTOR STRENGTH.

FAST, EASY SPOTTING . . . In confined underground operation, Dumptors spot fast, close to shovel . . . no need to turn. Big flared 8' x 8' body permits loading over end or sides. Shovel operator has easy-to-hit target, less spillage, short swing.

NO-TURN SHUTTLE HAUL . . . Dumptors travel same speed forward and reverse . . . save slow jockeying back and forth at the loading unit, on the haul, at the dump. Yet, Dumptors have plenty of maneuverability . . . turn in a tight circle of 19'-6" radius.



. . for every ton of payload

TO stand up under the most severe loading shocks of mine, quarry and construction service, Koehring Dumptors have more than a ton of net vehicle weight for every ton of payload. Sides, end and bottom of all-welded 6-yard body are heavily reinforced with 4" channel ribs. More than triple strength built into the bottom cushions shocks of rock loading. Seasoned 1⅝" oak timbers are securely bolted between two layers of 5/16" steel plate. Free-swinging kick-out pan adds another tough 3/16" high-manganese steel plate to Dumptor bottom for extra protection.

To withstand punishment of rough, off-road hauling, there's plenty of strength, too, in the heavy-duty chassis. Dumptor has rugged main frame of 8" ship channels, heavily trussed . . . 1-piece steel drive-axle housing and transmission case . . . 4" chrome steel drive axles . . . cast alloy steel "I" beam steering axle. There are no leaf springs . . . just one big, double-coil chassis spring on steering axle . . . none on drive axle. Big, shock-absorbing drive tires eliminate need for more. That means no spring maintenance.

For fast acceleration, less shifting, more gradeability, Dumptors also have 6 HP for every ton of gross weight . . . climb grades up to 24% fully loaded. Learn, too, how 1-second gravity dump eliminates body hoist maintenance . . . saves 15 to 25 seconds on every cycle with Dumptors. Get all the facts from your Koehring distributor.

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for battery-electric mine locomotives, trammers and shuttle cars of all sizes, types and makes

IT'S OUTSTANDING... in design, performance, length of life. Back of the improved Exide-Ironclad battery are years of progressive research-engineering that have developed a continuous flow of improvements. *Now comes another great advancement*...

A NEW and EXCLUSIVE FEATURE—the polyethylene insulating tube sealer. This and other major improvements combine to make Exide-Ironclad, *more than ever before*, YOUR BEST POWER BUY... AT ANY PRICE.

BUILT TO GIVE YOU...

RAPID, HIGH-PRODUCTION HAULAGE, more trips per shift... HIGH MAINTAINED VOLTAGE, with uniform speed to end of shift... HIGH AVAILABILITY... LOW OPERATING COSTS... LOW MAINTENANCE COSTS... LOW DEPRECIATION COSTS ...SAFETY from hazards of fire and fumes.

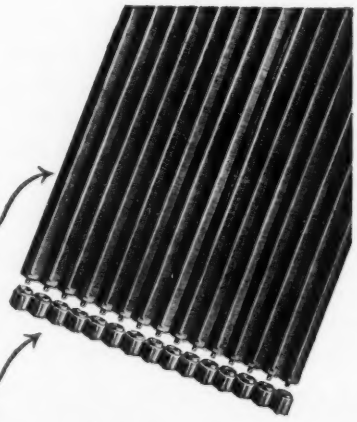
BECAUSE OF...

IMPROVED POSITIVE PLATE CONSTRUCTION

...the long-life grids now contain SILVIUM—an alloy of silver, lead and other components—which make them highly corrosion resistant. Top conducting bar is heavier.

... with the New Polyethylene insulating tube sealer

An insulating sealer for the bottom of the tubes. Acid-proof, non-corroding plastic, it fits snugly into slotted tubes of positive plate, and reduces loss of active material. Even the small sediment deposit of the past is reduced 50%. Thus, more active material remains available, and the high battery capacity is sustained for longer working life.



YOUR BEST POWER BUY..

PERMANIZED NEGATIVE PLATES

Improved processing, a result of Exide Quality Control assures uniform plates with higher electrical efficiency. These negatives, teamed with the improved positive plates, give you a well-balanced combination for hard service and long life.

NEW SEALING COMPOUND

Through the cooperative efforts of Exide Laboratories and the Franklin Institute, a new homogeneous compound was developed. It makes a permanent seal between the jar and cover, resisting shock without cracking in high or low temperatures.

SEAMLESS SHOCK-PROOF JAR

Made of high quality rubber. A scientifically selected combination of tensile strength and elongation provides a sturdy jar built for long life and heavy-duty service.

CORROSION RESISTANT TRAY GUARD

A plastic acid-resistant steel tray coating with high insulating quality and ability to withstand hard knocks.

NEW UNBREAKABLE PLASTIC VENT PLUGS

Made of unbreakable polyethylene. Can be quickly and easily removed to add water.

Types and sizes for storage battery applications in all heavy-duty services.

Write today for further information.

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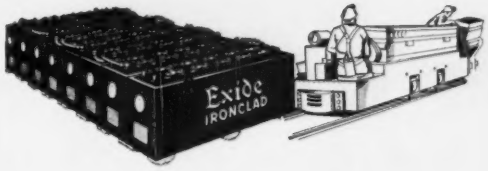

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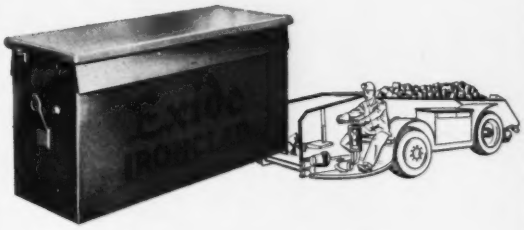
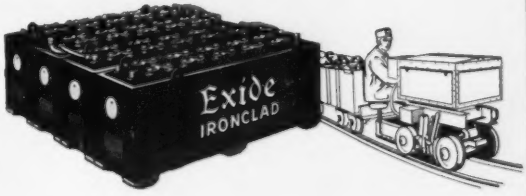


FOR SHUTTLE CARS



FOR TRAMMERS

. . AT ANY PRICE

You get *DOUBLE DUTY

JOY TELESCOPIC FEED STOPERS

The S-91T provides a steel change of 36", compared with the 18" change of conventional stopers. In most mining conditions, this long feed will give more drilling time, with fewer steel changes and fewer lengths to stock.

At left, the Joy S-91T Stoper in operation; above, with telescopic feed leg retracted; right, with leg extended, giving a 36" drilling feed. Another feature, instant; "thumb-flip" rotation release, provides safety and easy spotting of holes.

JOY

HAND-HELD DRILLS

A complete line of well-balanced, compact drills, ranging from 27 to 67 lbs. in weight.

The L-57 and L-67 Joy Hand-Held Drills are also available with mounting brackets for use as light drifters, or for wagon drill mounting.

Joy Jibs are hydraulically controlled booms for drill mounting on Jumbos, or on rubber-tired, self-propelled Drillmobiles.

JOY HYDRO DRILL JIB

Air-hydraulic control of all jib movements eliminates heavy lifting, and permits more accurate hole spotting for more efficient use of powder and controlled breakage.

1851—1951—100 YEARS OF ENGINEERING LEADERSHIP

with JOY DUAL-VALVE SILVER STREAK DRILLS

Maximum Footage–Maximum Economy

In tunnels, crosscuts, drifts, or stopes, Joy *Silver Streak* Rock Drills with the DUAL VALVE will do your drilling job faster, and use less air with lower maintenance. Here's why—

(1) The exclusive DUAL VALVE, a feature of all Joy rock drills, makes air do more work. By admitting the correct amount of air behind the piston and excluding air ahead of it during the drilling stroke, maximum force is exerted on the drill steel. There's no cushion of air ahead of the piston to reduce the force of the blow. Then the rear section of the Dual Valve meters the correct amount of air ahead of the piston to force it back with a "snappy" rotating action. This adds up to more power-packed strokes per minute, for faster drilling with less air.

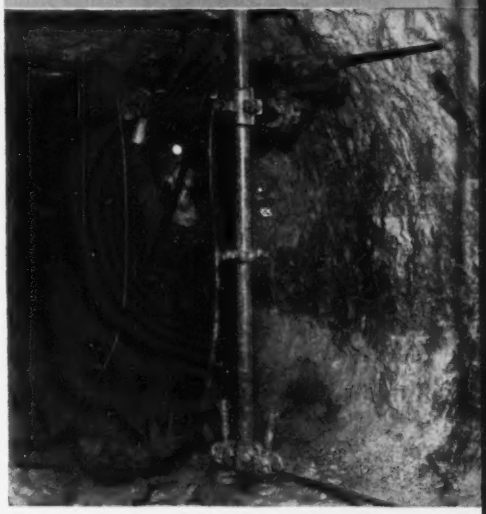
(2) The silver-like cadmium plating on Joy *Silver Streak* Rock Drills aids lubrication while running-in, protects parts from rust while in stock, and keeps maintenance costs at a minimum.

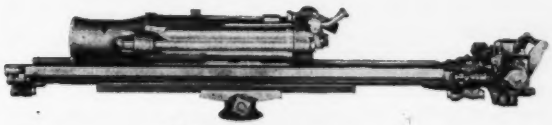
The Joy line is complete. There's a *Silver Streak* rock drill for every rock breaking need. Shown here are drifters, stopers, hand-held drills, Hydro Drill Jibs. To complete the line, there are wagon drills; the QB-20 for line drilling and dimension stone quarries; rubber-tired, self-propelled Drillmobiles; and specially mounted drills for special needs.

● ***Let our Field Men work with you.***

JOY **DUAL VALVE**

"Makes Air do More Work"





JOY **DRIFTERS**

For column mounting, as at right, or for use on mobile jumbo units, Joy Drifters are built in three sizes—all with fast, powerful Dual Valve action. Efficient Pistonmotor Feed, with only two moving parts, provides strong, steady advancement and retraction. One-piece locking chuck increases bearing area and reduces wear on lock ring and chuck bushing.

Consult a Joy Engineer

W&D

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

"Bedeviled Copper" helps to build a battleship

• The hard, ductile, malleable metal known as NICKEL derives its name from "kupfer-nickel", meaning *bedeviled copper*, a name given it by superstitious medieval Saxon miners. These miners, in uncovering what appeared to be a fresh lode of silver ore, thought the devil of the earth, *"Old Nick"*, had cast a spell over their ore since it could not be hammered into useful articles . . . *and it was several hundreds of years later that Cronstedt's discovery led to the actual recognition of nickel.*

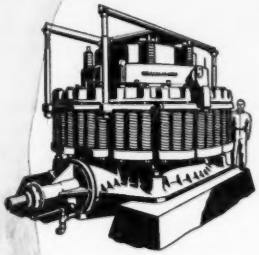
Among the thousands of ways in which nickel now serves man is in the construction of a modern battleship—where this versatile corrosion-resistant metal is used in armor plate, gun tubes, and scores of other ordnance, navigational and communications material.

From the opening of the first Sudbury mine in 1886, the history of nickel is largely that of *International Nickel Company*, who today produce fully 75% of the world's total nickel output. Playing an important role in International Nickel Company's production are twenty *"SYMONS"* Cone Crushers . . . which are recognized throughout the world for their ability to efficiently produce a great quantity of finely crushed product at low cost.

Thus, through the 20 "SYMONS" *Cone Crushers at "Inco" mines passes the majority of nickel used today . . . one more example of a job well done by* "SYMONS" *Cones.*

C652

NORDBERG MFG. CO., Milwaukee, Wisconsin



• "SYMONS" Cone Crushers . . . the machines that revolutionized crushing practice . . . are built in Standard, Short Head, and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter —in capacities from 6 to 900 tons per hour.

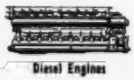
"SYMONS" . . . A NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

"SYMONS" Primary Crushers

Grinding Mills

Mine Hoists

"SYMONS" Vibrating Bar Grizzlies and Screens



Diesel Engines

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON • TORONTO

MEXICO, D.F. • LONDON • PARIS • JOHANNESBURG

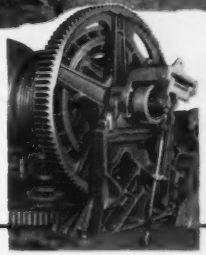
Another NORTHWEST On The Range!

See those tooth marks! That's tough overburden! Note the dipper full, too! If you have a *real* Rock Shovel you can be sure of output in *any* kind of digging.

This Northwest is stripping iron deposits on Minnesota's Iron Range and is one of the over sixty Northwests that Peter Kiewit & Sons Co. of Omaha, Neb., owns and operates.

Northwest owners often find that the faster swing and faster loading ability out produce larger machines under certain conditions. The "Feather-Touch" Clutch Control gives smooth, ease of operation without resorting to complicated equipment, pumps, etc. Northwest steering more easily negotiates pit floors or benches. The Northwest Dual Independent Crowd utilizes force most other independent crowd shovels waste. Northwest simplicity of design makes upkeep easy in distant locations. These things make the Northwest a real Hard Rock Man's tool.

Now is the time to investigate and plan. Find out about a Northwest. Talk it over with a Northwest man.



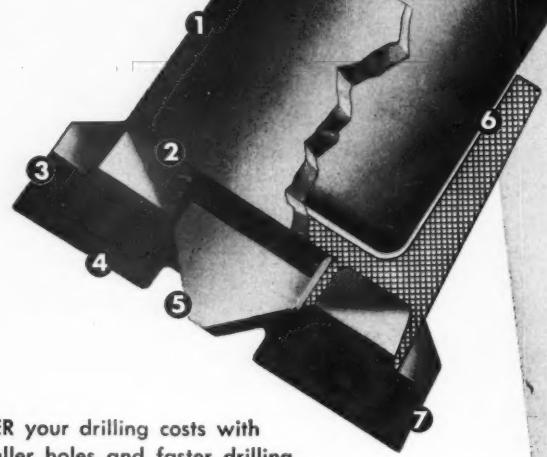
The Northwest "Feather-Touch" Clutch Control—easy operation through a simple mechanical device that throws the drum clutches. No pumps, no compressors, no valves or tubing. Adjustment is simple. Release is positive and the "feel of the load" is always present.

NORTHWEST ENGINEERING COMPANY
1509 Field Bldg., 135 South LaSalle St., Chicago 3, Ill.

Convertible for any Mining, Material Handling or Excavation Problem

Cut drilling costs with THROWAWAY Bits...

Save Steel
Save Powder



1 Easily deformable skirt permits quick removal of bit from shank. No lost time with stuck bits.

2 Ample chip clearance allows faster drilling.

3 Short reaming sides eliminate sticking and allow close gauge following.

4 Blunt non-breaking cutting edges have self-sharpening tendency . . . are uniformly tempered hard, biting steel.

5 Large hemispherical non-plugging water outlet.

6 Lathe-cut, ground or forged parallel shank fits firmly into close tolerance bit socket. No threads required. Perpendicular socket wall allows shank to bottom in bit for maximum performance.

7 Perfect uniformly treated bit teeth assure best possible cutting power and smooth operation.

LOWER your drilling costs with smaller holes and faster drilling. Bottom with 1¼ inch holes and save costly steel and powder. Let us prove to you that the man at the drill can do more work for less cost with a Throwaway Bit. Write for new low price list and technical description of Throwaway Bit to: Portland, Oregon home office or distributors listed below. Competent field engineers and dealers are always at your service.

THROWAWAY BIT CORPORATION

4200 N. W. YEON AVENUE., PORTLAND, OREGON

BONNE TERRE FARMING & CATTLE CO
Bonne Terre, Missouri

CREATING ENGINEERING
825 1st National Bank Building
Denver, Colorado

GREENAWALT-WHEELOCK & CO.
415 Mills Building
El Paso, Texas

guardian genie of MINING CABLE

JOY STEAM HEATED VULCANIZERS

Illustrated above is a typical rejacketing job on a cable splice made with a JOY Vulcanizer and a type "B" Mold.

MOLDS AND SUPPLIES . . . JOY has them all. Each carefully designed or compounded to help you make professional *on-the-job* repairs of electrical cable jacketing. Bulletin RV106 (at right) describes this material and provides valuable operating recommendations.

If there is a kindly spirit that looks out for mining equipment, JOY Cable Vulcanizers certainly rate among its best tools. Every year since their introduction in 1928, they've been more widely used for cable conservation. Today, with replacement cable often difficult to obtain—and with proper on-the-job repairs therefore multiplied in importance—JOY Vulcanizers really are the *guardian* of portable power lines.

Why take chances with cold-taped splices when *permanent* repairs can be made so easily and economically with JOY's proved method of cable maintenance? ● You'll want to know how our 1952 units are being used to help maintain high mining production schedules in spite of cable shortages. *Ask for a full description of the many advantages of hot vulcanization today!*

YOURS FOR THE ASKING . . . A copy of this attractive 16-page bulletin covering JOY Steam and Direct Heat-type Vulcanizers, Molds and Supplies has been reserved for you. *Write for it now.*

Consult a Joy Engineer

W&D CL 410

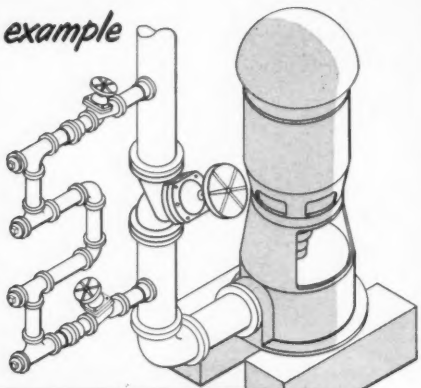
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

How's This For Solving a Valve Problem ...on Corrosive Well Water,

for example



THE INSTALLATION

On outlet of well water pump supplying plant of Barr Rubber Products Co., Sandusky, Ohio. Sulphur content of water extremely high.

THE HISTORY

Valves formerly used here lasted no more than 6 months. Under constant exposure to severe erosive and corrosive effects, they failed to provide the easy operation and positive seating needed in this service. They required excessively frequent re-packing and seating maintenance.

Problem solved by replacing with Crane Packless Iron Body Diaphragm valves in main line and by-pass. Installed more than a year, they show no corrosion, no effects of service. Operate smoothly, seat tightly, with no maintenance needed to date.

VALVE SERVICE RATINGS

SUITABILITY:
Just what was needed

MAINTENANCE COST:
None to date

CORROSION-RESISTANCE:
No evidence of corrosion

SERVICE LIFE:
Outlasted any 2 other valves so far

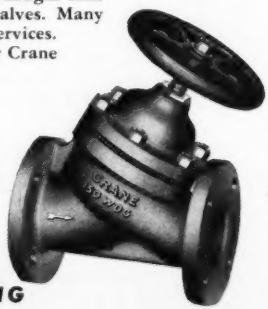
OPERATING RESULTS:
Pump shutdowns for valve repairs stopped

PRICE:
Much less than alloy valves

AVAILABILITY:
Stock item in Crane line

THE VALVE

Crane No. 1611 Iron Body Packless Diaphragm Valves featuring separate disc and diaphragm. No packing to maintain; no stem leaks. Neoprene diaphragm used to seal bonnet only. Independent disc with neoprene insert insures positive seating even should diaphragm fail. Also fully neoprene lined valves. Many common and corrosive services. See your Crane Catalog or Crane Representative.



The Complete Crane Line Meets All Valve Needs. That's Why,
More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Steady heart

A "Cat" Diesel D318 Engine is the steady heart of this Lorain Shovel which moves 800 tons of material every 16-hour working day. The shovel is moving ore in a bauxite mine in Sweet Home, Ark.

Nothing compares with durable "Caterpillar" Diesel Engines, reports owner L. D. Riffe, vice-president of Riffe Construction Co., Sweet Home. A survey of the field has convinced him that he made a wise selection.

"I have watched other people's equipment plus my own and I find that the 'Caterpillar' Engine is the only one," he explains.

It's no accident that the "Cat" Diesels stand out by comparison. Each power unit is thoroughly dynamometer tested to assure complete horsepower output. They are built for hard labor with low fuel consumption and low depreciation. They are compact—easy to install and just as easy to operate.

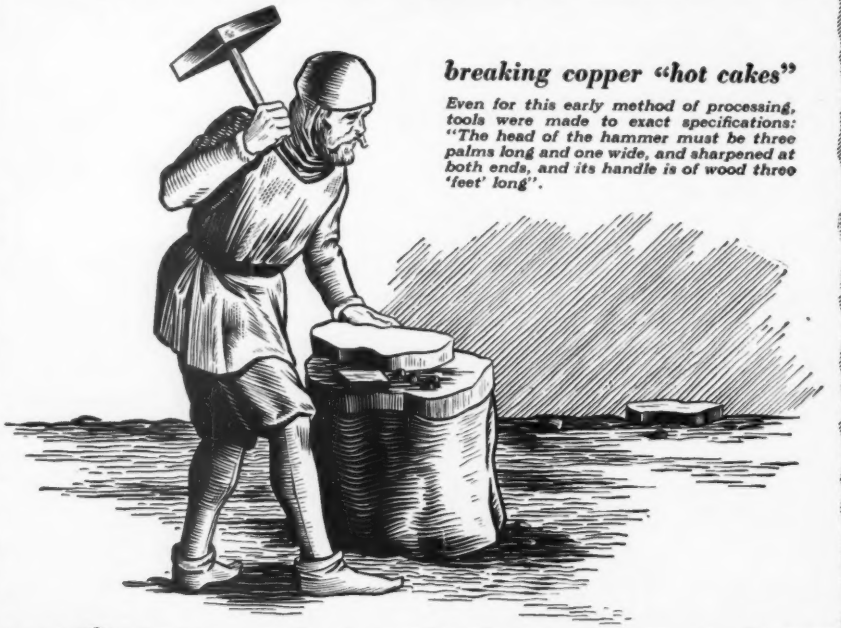
A complete line of "Caterpillar" Diesels enables you to select the right size engine for your job. Specify "Cat" Engines for the equipment you buy. And, let your "Caterpillar" Dealer help you repower your present machines, today.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR

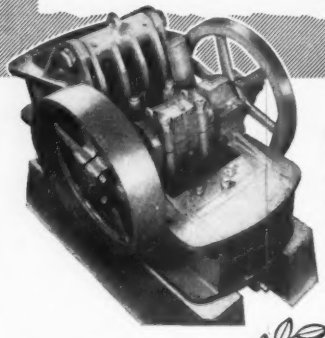
REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT



breaking copper "hot cakes"

Even for this early method of processing, tools were made to exact specifications: "The head of the hammer must be three palms long and one wide, and sharpened at both ends, and its handle is of wood three 'feet' long".



16 Traylor H and HB Jaw Crushers offer a wide choice of sizes to meet your exact needs.

No matter how primative, craftsmen have always been particular about the tools of their trade . . . always looking for better equipment, better technique. For 50 years, Traylor has fostered this tradition in the mining industry by the steady development of new and more efficient machinery. When you need crushing equipment, buy machinery backed by a half-century of design and production experience . . . machinery that is traditionally better. Buy Traylor.

OUR GOLDEN ANNIVERSARY YEAR 1902 1952

TRAYLOR ENGINEERING & MANUFACTURING COMPANY

1402 MILL ST., ALLENTOWN, PA.

SALES OFFICES: New York • Chicago • Los Angeles

Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.

a **Traylor** *leads to greater profits*

Tough answer to a *Tough* problem

A SUPER-BRIGHT RED COVER AIR HOSE

EVEN in the most rugged hose service — direct connection to compressors in mines, quarries and construction operations — you can depend on REDWING-H Cord Air Hose for longest, trouble-free service.

That's because this hose was developed by the G.T.M. — Goodyear Technical Man — to take hard knocks in stride. Everything from its oil-resistant tube to the red cover of tough, resilient stock adds up to long life at lowest over-all cost.

Ask the G.T.M. about REDWING-H Cord Air Hose for your tough jobs. Or see your nearest Goodyear Industrial Rubber Products Distributor. Available in continuous lengths, for working pressures from 200 to 350 lbs. psi maximum; sizes from ½" to 1½" I.D.

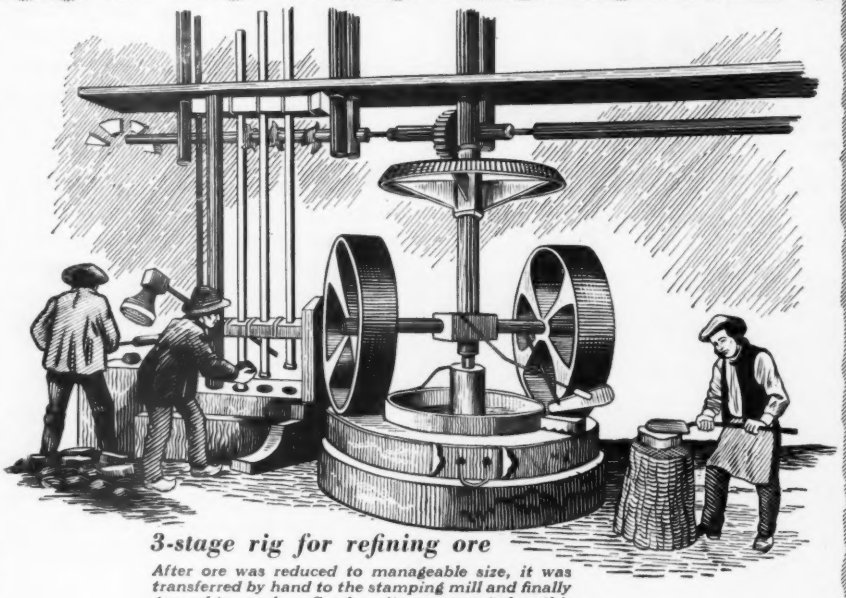
GOODYEAR INDUSTRIAL RUBBER PRODUCTS
GTM-Specified
REDWING-H CORD AIR HOSE
A
B
C
A—synthetic tube is seamless, nonporous, non-flaking, oil-resistant
B—two or three braids of high-strength rayon reinforce against shock blows
C—red cover of heavy, resilient stock bounces away abrasion, cuts, gouges

LOOK FOR YOUR GOODYEAR INDUSTRIAL RUBBER PRODUCTS DISTRIBUTOR *in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods." He handles Hose, Flat Belts, V-Belts, Molded Goods, Packing, Tank Lining, Rubber-Covered Rolls built to the world's highest standard of quality.*

GOODYEAR

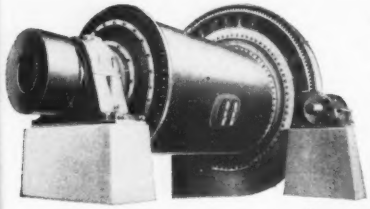
THE GREATEST NAME IN RUBBER

Redwing—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



3-stage rig for refining ore

After ore was reduced to manageable size, it was transferred by hand to the stamping mill and finally ground to powder. Crude as it may seem today, this rig was once the ultimate in production efficiency.



Traylor builds four types of grinding mills in a wide choice of sizes to meet your exact needs.

History excitingly illustrates the speed with which our machine age advances. And Traylor is proud of the part it plays in this movement. For 50 years, Traylor has led in developing new designs and producing better machinery for the mining industry. In that time, Traylor equipment has gone all over the world, building a name famous for efficient operation. It takes experience to come up with the right answers consistently. Traylor has experience . . . half a century of it. Use it to your advantage.

TRAYLOR ENGINEERING & MANUFACTURING COMPANY

492 MILL ST., ALLENTOWN, PA.

SALES OFFICES: New York • Chicago • Los Angeles

Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.

OUR GOLDEN ANNIVERSARY YEAR

1902 1952

a **Traylor** *leads to greater profits*

FOR LOW-CURRENT CRUSHER STARTING

PLUS HIGH PEAK LOAD CAPACITY

WOUND-ROTOR INDUCTION **MOTORS**

Built for a crusher in a copper ore processing plant, this motor is rated 350 hp, 252 rpm.

WHETHER STARTING OR RUNNING, Allis-Chalmers wound-rotor motors fit your crusher drive requirements. Low starting kva minimizes power supply problems. High breakdown torque—250% or more if needed—gives you motors that romp through short-time peak loads . . . and compensates for line voltage drops.

Engineered to your specific requirements, these motors can be built for constant-speed crushing or to provide economical variable-speed operation.

DESIGN ADVANTAGES

Because Allis-Chalmers builds controls and crushers as well as motors, you can be sure that each motor design detail will be suited to the application.

Because each motor is built to uphold the Allis-Chalmers tradition of reliability, you can be sure of rigid shafts, sturdy welded stator yokes, ample even cooling, and liberally proportioned sleeve bearings.

Because routine inspection and maintenance extend motor life, you will get design features that simplify that work. For example, the brush rigging is supported below the bearing center line so that the bearing cap is easily removed.

NEW BULLETIN

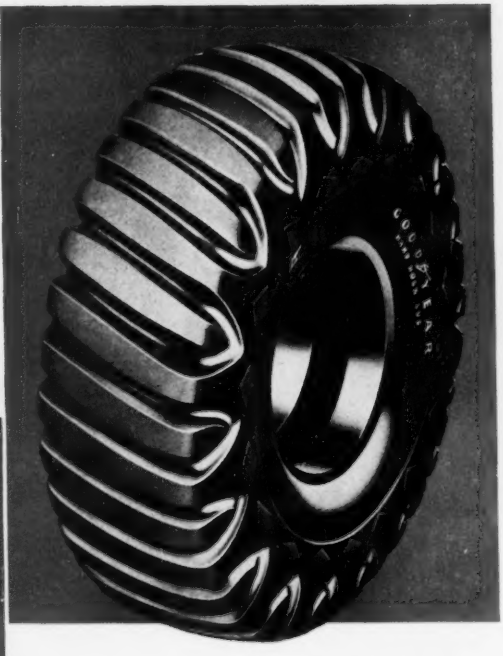
Large pedestal-bearing induction motors are described in detail in illustrated Bulletin 05B7771. Ask your nearby A-C representative for a copy of this bulletin, or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3724

ALLIS-CHALMERS

TOUGH *and then some!*

HARD ROCK LUG

Super-tough champ for all types of rock work. Its armored body and extra-heavy lugs assure longer wear, better performance, even in the toughest going.



There's A Cost-Cutting Goodyear Tire For Every Job

HARD ROCK RIB

Companion tire for front wheels in rock work — easier steering, smooth rolling, same cord body and construction as the Hard Rock Lug.

ROAD LUG

Dual-purpose tire operates both OFF and ON the road. Combines off-the-road toughness and traction with on-the-road mileage and economy.

So ruggedly tough is Goodyear's Hard Rock Lug tire that it can take the bruising punishment of pit, quarry and mining service longer and better than other tires. That's why it's *first choice* with cost-wise operators in all types of rock work. Get the right Goodyears for *your* jobs, and experience will prove that it pays to BUY and SPECIFY Goodyear.

Road Lug—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Best proof of cost-cutting performance:

MORE TONS ARE HAULED ON

GOODYEAR

TIRES THAN ON ANY OTHER KIND

Louis A. Stiles, Supt. and M. Gallup
of G. L. Tarlton Contracting Co.

G. L. TARLTON CONTRACTING CO.

P. O. Box 464
Fort Collins, Colorado

April 12, 1952

The Eimco Corporation
P. O. Box 300
Salt Lake City 10, Utah

Attention: Harold Klepp

Gentlemen:

As you know we have just established a new world record of 111' in 24 hours of tunnel driving at tunnel No. 4 of the North Poudre supply tunnels.

We attribute our success to excellent supervision, the good teamwork of our crews, the good drilling and the dependability of the equipment.

All of the loading was done with Eimco Model 21 loaders, in our estimation the absolute dependability of this equipment was a major factor in making this record possible.

The men responsible for this record are Louis A. Stiles superintendent, Arthur Stiles miner, Clinton O. Ames, Loren Huffman and Ray Hooper drifters and Howard Carter, William Coley, and James Doggett muckig machine operators.

The tunnel is the Bureau of Reclamation semi-elliptical design 10 feet in the rough 8 feet finished. 13 ten foot rounds were made in the 24 hour period netting 111 feet. Seventeen less than 2 hours per complete round. 36 holes per round were drilled, 111.5 lbs of powder were used per round.

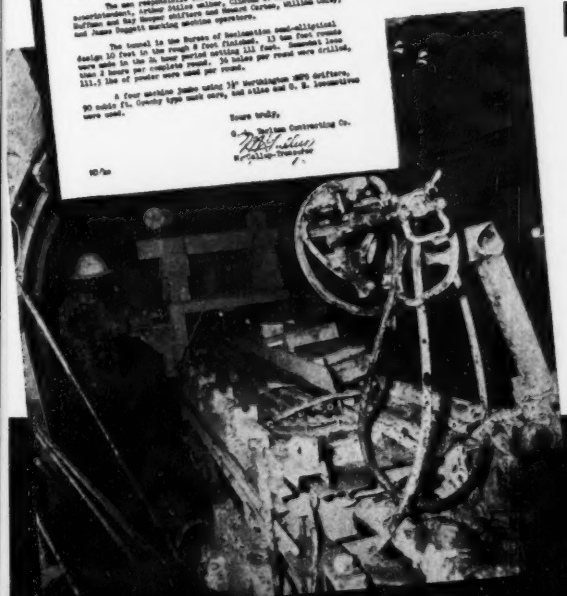
A four machine jumbo using 14' Sullivan water drifters, 90 cubic ft. Gyrotty type muck cars, and Atlas and G. E. locomotives were used.

Yours truly,

G. L. Tarlton Contracting Co.

M. Gallup-President

MG/ao



A NEW WORLD'S RECORD FOR HIGH SPEED TUNNELING

The G. L. Tarlton Company, contractors for U.S.B.R. on the North Poudre Supply Tunnel, drove 111 ft. of 9' 4" semi-elliptical tunnel in 24 hours, April 10, 1952; thus establishing a new world's record for footage driven in 24 hours, and beating the old record by more than 6 feet. The loading job was done by Eimco Model 21 Loaders. Other specifications of the job follow: Average depth of round drilled — 10'; Steel — all 10' lengths; Bits — carbide insert, detachable type; Drills — 4 at face, 1 spare; Cars — 91 cu. ft. granby type; Holes per round — 36; Rounds this day — 13; Time of rounds, average — 35%—Drilling, 15%—Loading, 15%—Powder fumes exhausting, 35%—loading; Formation — Sundance Sandstone, Lykins formation.

EIMCO

A301

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES — SALT LAKE CITY 10, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES:

NEW YORK: 51-52 SOUTH STREET • CHICAGO: 3319 SOUTH WALLACE STREET
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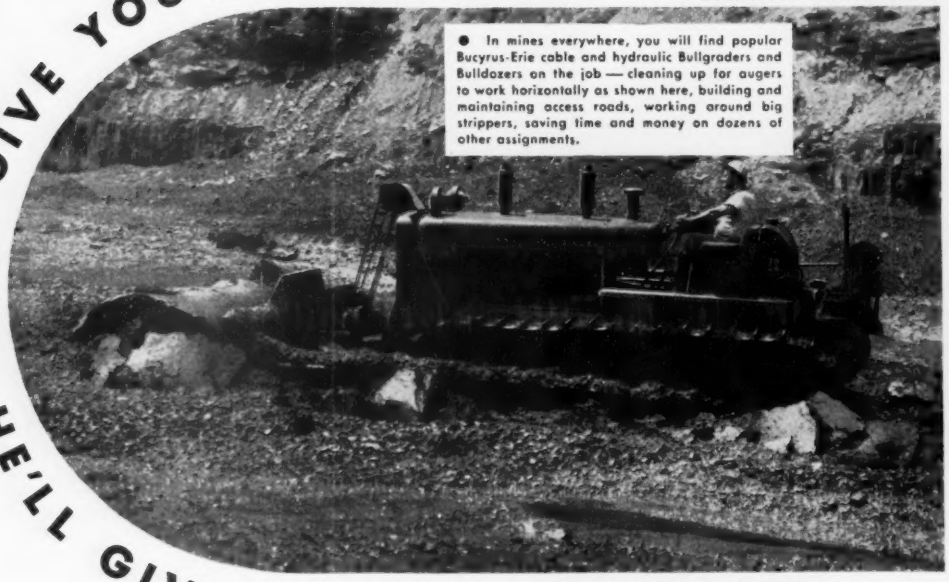
EL PASO, TEXAS: MILLS BUILDING • BERKELEY, CALIF.: 637 CEDAR STREET
KELLOGG, IDAHO: 307 DIVISION ST. • LONDON W. 1, ENGLAND: 190 PICCADILLY

IN FRANCE: SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 11, ENGLAND
AGENTS IN ALL PRINCIPAL SITES THROUGHOUT THE WORLD

GIVE YOUR OPERATOR THE OUTFIT



● In mines everywhere, you will find popular Bucyrus-Erie cable and hydraulic Bullgraders and Bulldozers on the job — cleaning up for augers to work horizontally as shown here, building and maintaining access roads, working around big strippers, saving time and money on dozens of other assignments.

HE'LL GIVE YOU THE OUTPUT

With an easy-to-handle Bucyrus-Erie Bulldozer or Bullgrader your operator has a digging tool that's designed to give him the most in work capacity and safety — at a minimum of effort. For example:

He Sees What He's Doing ... Hydraulic cylinders are well back; on cable-operated units, front support frame or side beams are low. The operator can see exactly what the blade is doing — and stay seated. No superstructures to obstruct his vision.

... Is In Complete Command Center of gravity is kept low for greater stability when working on steep banks. Also with tractor balance point kept practically intact, blade doesn't tend to nose over at the edge of the dump, tractor works at top efficiency.

BUCYRUS ERIE

BULLGRADERS and BULLDOZERS

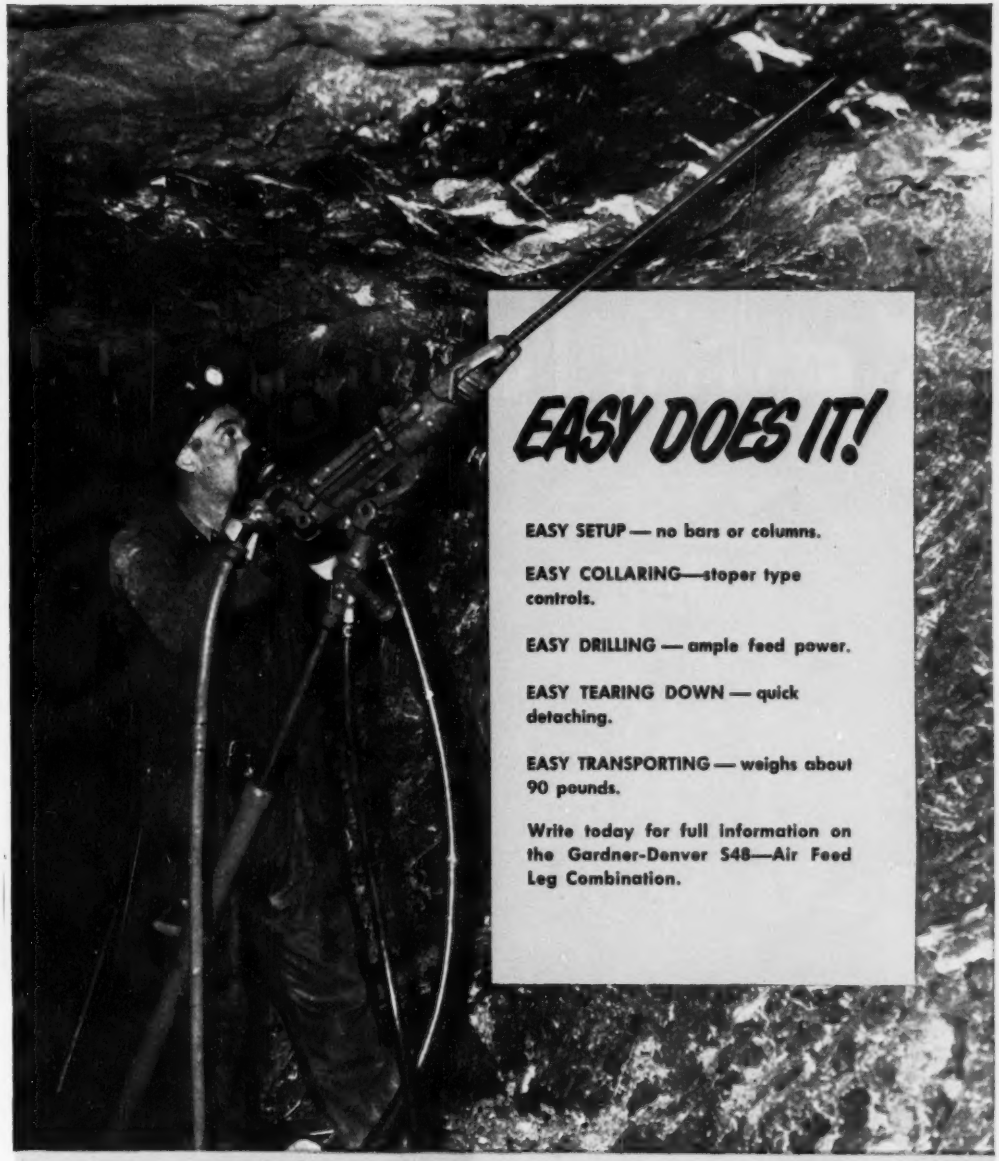
... And Comfortable Single, four-position hydraulic control lever is within easy reach of the operator, yet does not interfere with tractor controls. Winch control levers for cable-operated blades are easy to operate — conveniently located.

In addition, Bucyrus-Erie Bullgraders can be angled and tilted by the operator in a few minutes without special tools. Lubrication points are easily accessible. Your International Industrial Tractor distributor will be happy to give you full details.

37752

See Your INTERNATIONAL Industrial Tractor Distributor

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin



EASY DOES IT!

EASY SETUP — no bars or columns.

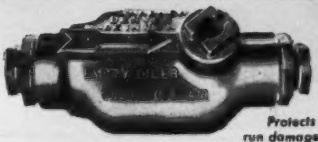
EASY COLLARING—stoper type controls.

EASY DRILLING — ample feed power.

EASY TEARING DOWN — quick detaching.

EASY TRANSPORTING — weighs about 90 pounds.

Write today for full information on the Gardner-Denver S48—Air Feed Leg Combination.



Protects against dry run damage—the LO12 Automatic Line Oiler.

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

Front view shows high-voltage receptacle. Door to low-voltage breakers is shown on the side.

Back view shows the four low-voltage receptacles.

LOW-COST MINE POWER CENTER

Here's the low-cost way of carrying high-voltage power to the vicinity of the working face . . . to take full advantage of better regulation, lower line losses. It's the new Westinghouse Power Center, designed for service where nonhazardous conditions exist. One complete package, the unit is contained in a sheet steel case. Because of its economical construction and natural draft air cooling . . . *it costs much less than a totally-sealed unit.*

Small, compact size makes it ideal for lowering into mine shafts. The largest rating, 300 kva, is only 26″ high and 45″ wide. For easy portability, it is mounted on skids and equipped with pulling eyes. A separate dolly with adjustable wheels is available for track haulage.

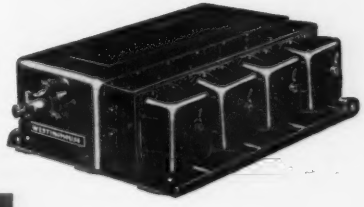
Other important advantages are:

1. Flexibility of voltages . . . from 2400 to 4160 on the primary and 120 to 480 on secondary.
2. Complete and separate protection for each outgoing feeder.
3. Fast disconnection and reconnection of feeders.
4. Safety . . . ground-protective system opens the affected breaker if ground fault occurs.

For complete information contact your nearest Westinghouse representative, or write for Booklet B-4428, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70604

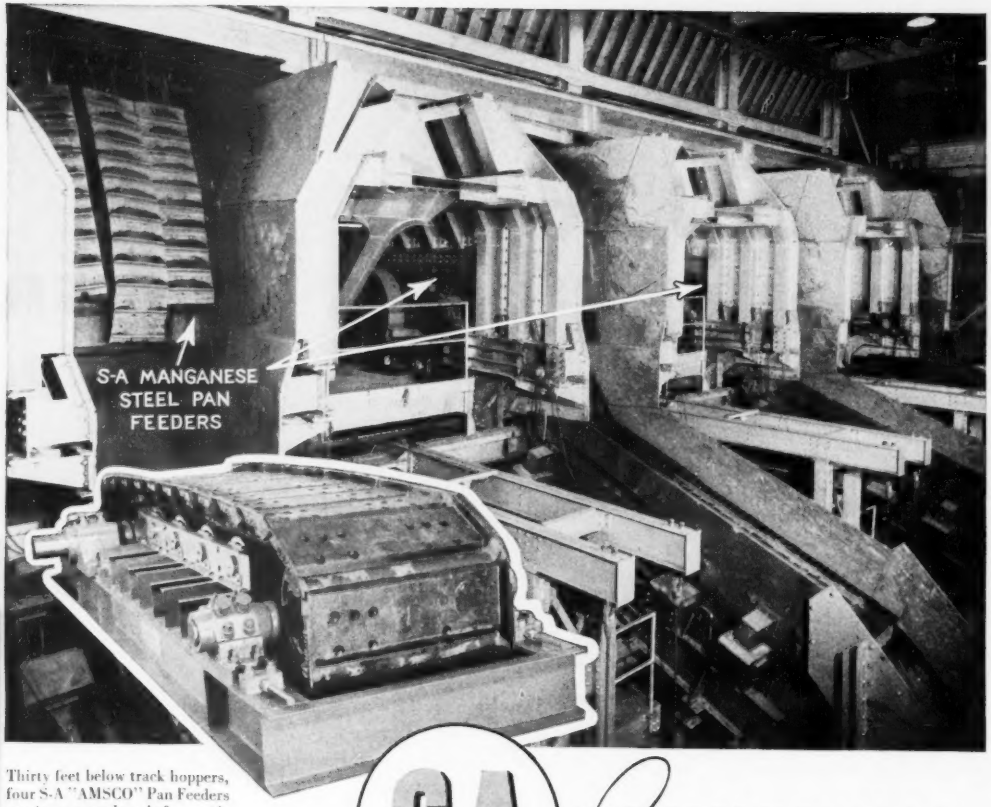
FOR HAZARDOUS CONDITIONS . . .
The Safest Power Center You Can Put in a Mine

This dry-type power center is totally explosion-proof. Comes with basic class C insulation, bonded with silicone . . . core and coils hermetically-sealed in an atmosphere of dry nitrogen.



YOU CAN BE SURE . . . IF IT'S Westinghouse

TRANSFORMER EQUIPMENT



Thirty feet below track hoppers, four S-A "AMSCO" Pan Feeders receive ore and rock from side dump rail cars. Each Feeder is 6 feet wide by 27 feet long. Together they have a capacity of 3000 tons per hour. Still another feeder (not shown) collects ore from the scalping screens.

S-A CONVEYING Systems

for **FEEDING ORE** in high volume . . . at low cost

Feeding huge volumes of heavy, abrasive ore and rock from receiving stations to scalping screens and primary crushing is one of industry's most punishing handling jobs . . . Yet S-A "AMSCO" Manganese Steel Pan Feeders have shown they can withstand and thrive on such crushing impact and abrasive loads . . . thousands of tons a day . . . year after year . . . with a minimum of maintenance.

Almost incredibly rugged, these feeders are another example of S-A engineering to provide continuous heavy duty handling at lowest cost-per-ton . . . Whatever your bulk handling problem, S-A engineers with their complete line of bulk handling equipment units can help you find the right solution for efficient, economical operations.

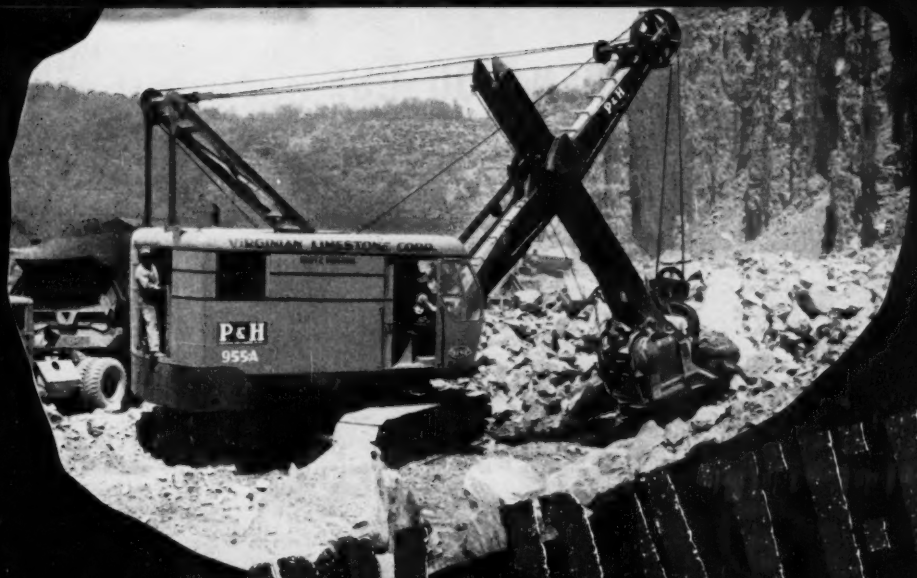
Belt Conveyors
Belt, Pan & Plate Feeders
Ship Loading Boom Conveyors
Stacking Conveyors
Storage & Reclaiming Systems
"Natural Frequency" Vibrating Conveyors
REDLER Conveyor-Elevators
ZIPPER Conveyor-Elevators
Conveyor Belt Cleaners
Headshaft Holdbacks
Grizzlies & Screens
Centrifugal Pilers
Bin Gates & Tunnel Gates
Car Pullers & Spotters
Bucket Elevators
Skip Hoists
SEALMASTER Ball Bearing Units

• *Write for a bulletin on any of the above.*

STEPHEN S-A DAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif., Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT



ROUGH

AND READY FOR ANY JOB

P&H ***MAGNETORQUE**** **Electric**

Swing is 15% to 25% faster than any 2½ yd. shovel

If it's husky strength you want, this is it! Tough all-welded construction throughout to take pounding and shock loads that would K.O. less rugged machines. It means steady digging — less maintenance — down through the years.

If it's speed, you have it with Magnetorque — speed to out-produce any other machine in the 2½ yd. class — with a swing that's 15% to 25% faster. It's the greatest shovel improvement in 20 years. We'll gladly tell you where to see the 955-A working nearest you. Ask today!

If you want larger capacity, ask for facts about the Model 1055 (3½ yd.).

*T.M. of Harnischfeger Corporation for electro-magnetic type clutch.

HARNISCHFEGER
CORPORATION
4454 W. National Avenue • Milwaukee 46, Wisconsin

POWER SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FABRICATED HOMES

NOBODY GUESSES WHEN YOU USE...

WALSEAL*

FOR MAKING SILBRAZ* JOINTS

When you see this fillet of alloy, and the fitting is Walseal you know that you have penetration because the alloy comes from the inside.

Cutaway view of a Walseal Tee showing: 1—factory-inserted ring of silver brazing alloy; 2—fillet of silver brazing alloy that appears upon completion of Silbraz joint; 3—cutaway view of the completed Silbraz joint showing that silver brazing alloy has flowed in both directions from the factory inserted ring.

When you make Silbraz* joints in your brass, copper, or copper-nickel pipe lines with Walseal Valves, Fittings, or Flanges you know you have the right amount of the correct type of silver brazing alloy. The ring of Sil-Fos brazing alloy is factory-inserted in the ports of Walseal products at the time of manufacture.

No lost time or motion in handling the alloy . . . no difficulty in getting full penetration of the alloy regardless of the position of the valve or fitting . . . no guessing whether the joint is made right . . . the fillet of alloy that shows up when the Silbraz joint is completed, comes from the inside!! And, whether you've made the Silbraz joint yourself, or inspecting the work of another, you know that if the silver alloy fillet is visible, and the valve or fitting is Walseal, you have full penetration. That's why nobody guesses when you use Walseal!

Walseal products are backed by the reputation of the Walworth Company, manufacturers of valves and pipe fittings since 1842.

For full information regarding Silbraz joints made with Walseal products, write for Circular 84.

*Patented—Reg. U. S. Pat. Off.

SEE OUR CATALOG IN SWEET'S

Recommended for

- Hot and Cold Water Circulating Systems
- Boiler Feed Lines
- Steam Return Lines
- Condensate Lines
- Low and High Pressure Air Systems
- Lubricating Oil Circulating Systems
- Industrial Gas Piping
- Solvent and Vacuum Piping Systems

Make it "a one-piece pipe line" with WALSEAL

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

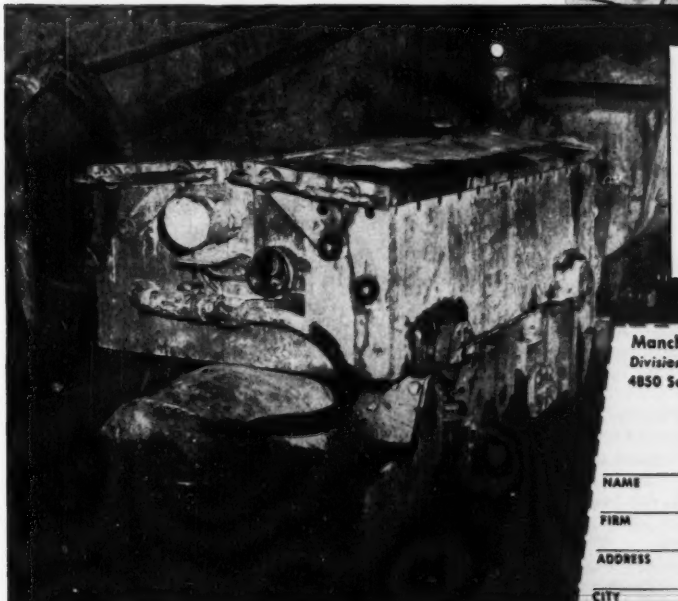
IF YOUR PROBLEM IS HAULAGE

write for MANCHA'S MINE HAULAGE DATA FORM It costs you nothing

This Data Form contains a carefully studied outline of questions concerning haulage systems. You fill it in, using the facts applying to your own conditions and requirements, then return it to us.

Without cost or obligation to you, Mancha engineers will analyze the information you submit, and tell you the maximum output that can be obtained in your mine with Mancha Storage Battery Locomotives. Then you can make your own comparisons.

Many a mine operator can trace a sharp upswing in his haulage efficiency to the analysis he obtained through Mancha's Mine Haulage Data Form service. Whether or not you are in the market for haulage locomotives today—SEND THE COUPON!



There's a Mancha Storage Battery Locomotive designed to exactly fulfill your haulage requirements. And you can depend on every Mancha for the uninterrupted service that spells steady production.

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
E & MJ - 652
Send your mine haulage data form.

NAME _____

FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

MANCHA STORAGE BATTERY LOCOMOTIVE
Division GOODMAN Manufacturing Company
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

SPECIAL STAINLESS STEEL INNER WIRE BRAID IS SECURELY LOCKED TO INSIDE WALL OF TUBE. You get this added safety protection and assurance of longer hose life only with CONCORD #20 STEAM HOSE . . . another of BWH's significant developments in the field of mechanical rubber products!

Resists Tube Swelling

Withstands Tough Usage

Concord #20
STEAM HOSE

Here's the steam hose with built-in long life . . . in the form of a special stainless steel inner wire braid.

This inner lining is there to fight tube swelling under continuous high pressure . . . a condition that kills ordinary steam hose — and usually kills it *fast.*

Found only in CONCORD #20 STEAM HOSE, this protection helps assure retention of original inside hose diameter . . . acts against swelling and constriction of tube . . . promotes full flow of steam and easy recoupling in the field when necessary.

CONCORD #20 includes other construction features: two or three braids (depending on size) of alternate high tensile steel wire and rubber layers firmly bonded over outside of tube for maximum burst protection and safety; an asbestos braid for positive cover adhesion and cover insulation; a rugged, abrasion-resistant cover that withstands the toughest abuse.

Put CONCORD #20 to work for you now . . . get in touch with your nearby BWH distributor today.

BWH
DEPENDABLE RUGGEDNESS

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Warehouse Stock: 111 N. Canal St., Chicago, Illinois **Distributors in all Principal Cities**

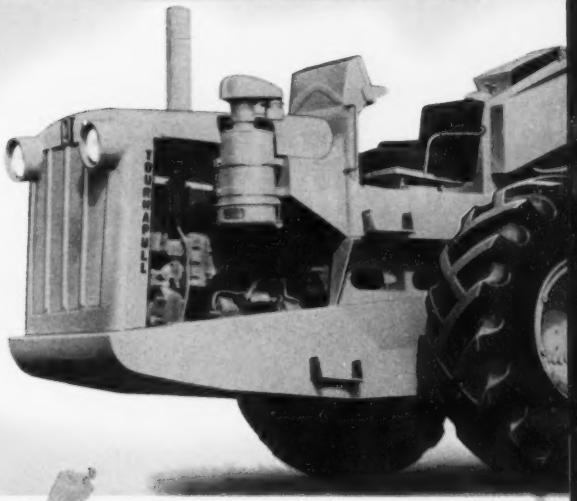
PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

Modern Mining Tools

you should know about

"D" size 2-wheel prime-mover

(122 h.p., speeds to 28 m.p.h.)

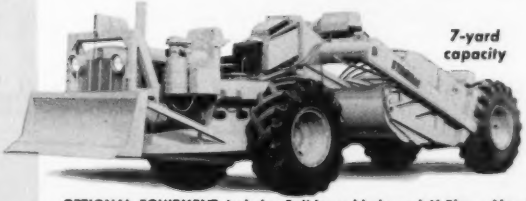


FOR USE WITH THESE INTERCHANGEABLE TRAILING UNITS:

9-ton capacity

10-ton capacity

7-yard capacity



For Hauling Jobs...

TOURNAROCKER — Highly-maneuverable rear-dump . . . turns in 12'4" radius . . . works fast in congested quarters. With front wheel drive, unit backs safely to edge of bank. Streamlined body pivots over rear axle, hoists electrically, dumps clear . . . saves most rehandling and clean-up.

For Lifting Supplies...

TOURNACRANE — Lifts up to 33' . . . reaches 35' . . . handles 10 tons with exceptional maneuverability. Sliding boom on tilting track moves load under low arches, through factory doors. Unit goes anywhere . . . through sand, mud, or snow . . . unloads supplies, etc. Fingertip electric controlled.

For Scraper Dirt...

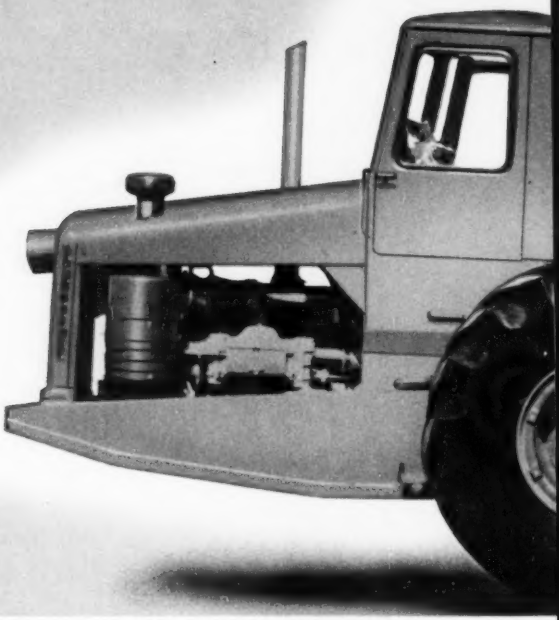
TOURNAPULL — Self-loads most scraper dirt . . . yet has ample capacity for profitable operation in pusher fleets. Hauls anywhere, on or off road. Also mounts 8 ft. Bulldozer for scattered maintenance jobs . . . interchangeable 9' V-Plow for opening haul roads, clearing rail lines, etc.

OPTIONAL EQUIPMENT *includes Bulldozer blade and V-Plow. Also 10-ton flat-bed Tournahauler available for interchange on prime mover.*

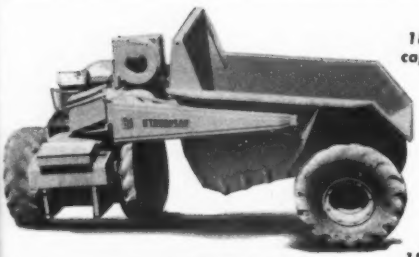
More modern mining tools

"C" size 2-wheel prime-mover

(186 h.p., speeds to 35 m.p.h.)



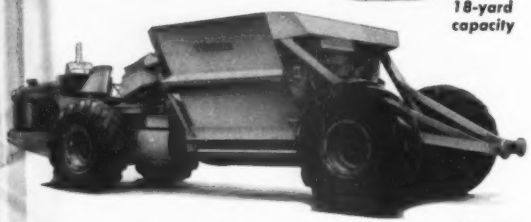
18-ton capacity



For Rear Dump Hauling...

TOURNAROCKER — Rugged, electric-control hauler for use under shovel, dragline, or conveyor. Wide bowl and low rear entry speed loading, reduce spillage. Hoisted electrically, body swings behind and below rear wheels at touch of dashboard switch. Turning radius — 13'9" at 90°.

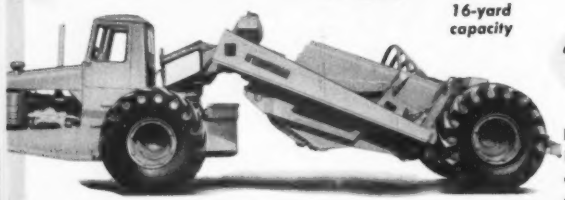
18-yard capacity



For Bottom Dump Hauling...

TOURNAHOPPER — Easy-loading, clean-dumping . . . goes through muck and gumbo with big high-flotation tires and Tournamatic torque-proportioning differential. Clam-type doors lift aside, up . . . leaves same opening as top . . . have 25" clearance open. 3,763 sq. in. total braking surface.

16-yard capacity



For Scraper Dirt...

TOURNAPULL — Job-proved over 15 years. This unit will beat all previous LeTourneau Scrapers of its size range . . . in any kind of scraper dirt, on both long and short hauls, for both output-per-day and cost-per-yard. 4-wheel air brakes, sliding gear or automatic transmission, power turns in 15' radius.

OPTIONAL EQUIPMENT *includes 15-ton Tournacrane, 20-ton flat-bed Tournahauler, and 7-yd. capacity Tournamixer (concrete transit-mixer).*

to fit your present problems

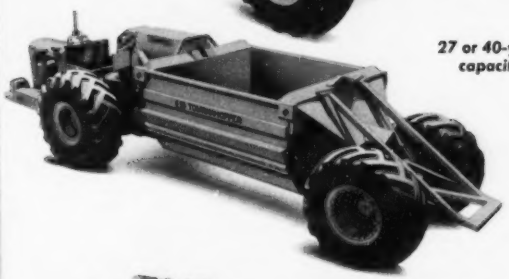
"A" size custom-built prime-mover

(275 or 450 h.p., speeds to 39 m.p.h.)

35 or 50-ton capacity

Big-capacity Rear Dump . . .

TOURNAROCKER — Same heavy-duty construction as smaller Tournarockers. Three-ply steel bowl resists load shocks, eliminates much welding and patching. Because unit has no frame, sub-frame, springs, spring hangers, drive shaft or hydraulics, many trouble spots are eliminated . . . maintenance costs reduced.



27 or 40-yard capacity

Big-capacity Bottom Dump . . .

TOURNAHOPPER — Easy loading, fast dumping. Clam-shell gates swing high, wipe clean . . . clear windrow or rock dump. Huge 30.00 x 33 low-pressure tires take rig anywhere . . . keeps it going when other equipment is bogged down. Body is quickly interchangeable with rear-dump, scrapers, or flat-bed.

27 or 42-yard capacity

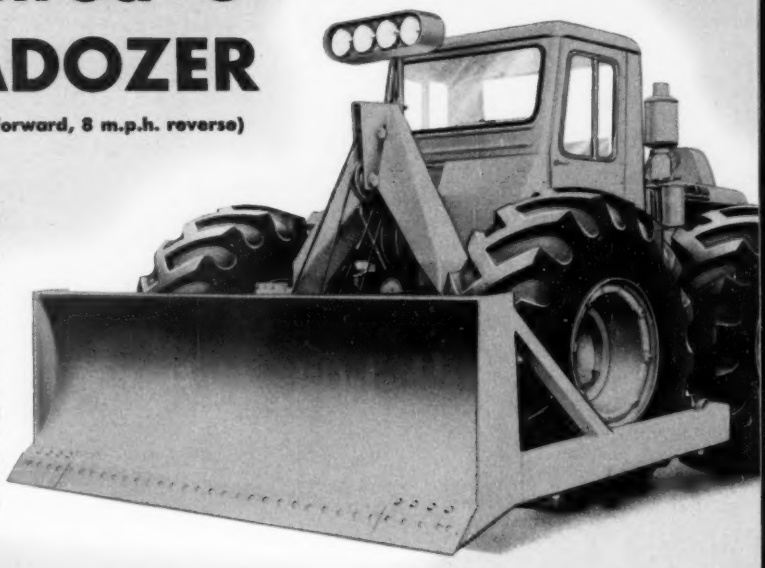
Big-capacity Scraper . . .

TOURNAPULL — Custom-built for maximum efficiency on volume dirtmoving. Makes 90° turns in less than half of own overall length. Over 8000 sq. in. total braking surface for operating safety on hills, in traffic . . . fingertip electric control of steer, shift, scraper — same as smaller units.

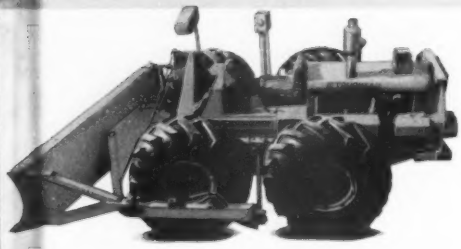
OPTIONAL EQUIPMENT *includes 30 to 50-ton flat-bed Tournahauler.*

Rubber-tired "C" TOURNADOZER

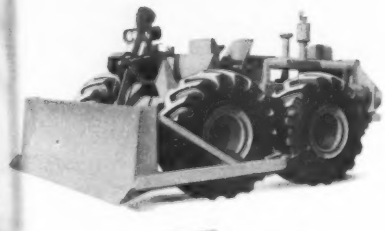
(186 h.p.; speeds to 19 m.p.h. forward, 8 m.p.h. reverse)



With powerful 4-wheel drive and rubber-tired mobility, Tournadozer does 2 to 3 times the work of ordinary crawlers. Rig is exceptionally versatile . . . strips overburden, levels dumps . . . dozes truck-dumped spoil over banks . . . cleans up for shovels or draglines . . . feeds hoppers, grizzlies, concentrators, crushers . . . hauls and spots heavy equipment. Its 19 m.p.h. speeds also make it ideal for maintaining haul roads, push-loading scrapers, and handling scattered maintenance jobs.



ANGLEDOZER . . . For extensive side-hill work, Tournadozer's regular Bulldozer is easily interchangeable with Angledozer and side arms. 13′ x 41″ blade can be angled 20° right or left . . . optional electric motor tilts either corner 10″ up or down for digging with blade point.



DOWN-PRESSURE . . . Cable-controlled attachment lets operator keep blade level while dozing, no matter how tough the material. Eliminates "wash-board" cuts in frozen ground . . . valuable for smooth back-blading of haul roads.

SIDE-BOOM CRANE . . . Lifts 5 tons at maximum 12′ reach . . . 14 tons to maximum 12′ height. Fingertip electric controlled. Maneuvers, spots loads "on a dime". Works, travels anywhere; carries load through mud, over pavement.

OTHER ATTACHMENTS . . . ROOT RAKE clears brush and rock from overburden area, prepares haul roads, cleans dump. 67,000-lb. WINCH skids pipe, heavy equipment, snakes logs, etc. DRAWBAR and double-drum PCU to pull Sheepsfoot Roller, Rooter, Carryall Scraper, Flat-bed Trailer. Heavy-duty Tournarope available for all types of equipment.

LETOURNEAU EQUIPMENT

R. G. LeTOURNEAU, INC., *Peoria, Illinois*

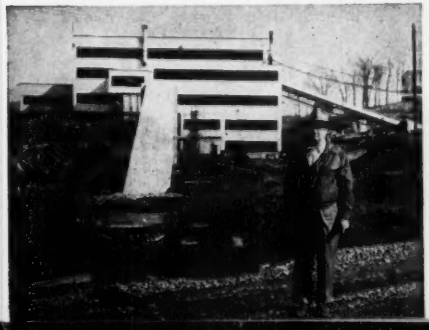
Tournarocker, Tournapull, Carryall, Tournacrane, Tournahopper, Tournamatic, Tournamixer, Tournadozer, Angledozer, Booter, Tournarope — Trademark Reg. U.S. Pat. Off.

Tournahauler—Trademark

Miners Coal Company reports that

Reinforced with Du Pont "Cordura," this belt (above) operates at 383 feet per minute up a 17-degree slope, delivering 525 tons of coal per hour. During its operation it has never been necessary to stop it for attention or repairs; and the belt has not stretched enough to be noticeable.

The slope belt lifts the coal 281 feet vertically to the large, modern tipple of the Miners Coal Company. It is 948 feet between centers. In foreground is Manager Kenneth Snarr.



Thinner belt reinforced with "Cordura" rayon trains better, loaded or empty

This 36" slope belt trains perfectly even when empty, according to Kenneth Snarr, Manager of Miners Coal Company, Madisonville, Ky. It was manufactured by the Manhattan Rubber Division of Raybestos-Manhattan, Inc., on a carcass made of Du Pont Cordura* High Tenacity Rayon.

The reason belts reinforced with "Cordura" train better is simple. "Cordura" rayon yarn is so much stronger than natural fiber yarns it permits a thinner belt with fewer plies. *Greater strength with less bulk.* These thin belts are naturally more flexible. So they train better. And the low stretch of "Cordura" yarn saves expensive shutdowns for take-up and resplicing.

Inquire about the advantages of belts reinforced with "Cordura" High Tenacity Rayon before you order your next conveyor belt. We'll be glad to send you the names of suppliers . . . also complete information about "Cordura" rayon. Just send for the *free* booklet, "Sinews for Industry." Address: Textile Fibers Department, Room 4421, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

*REG. U.S. PAT. OFF.

Du Pont "Cordura" High Tenacity Rayon

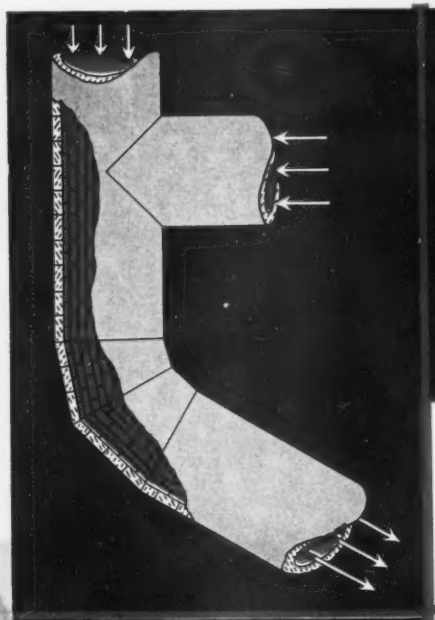
STRENGTH AT LOW COST

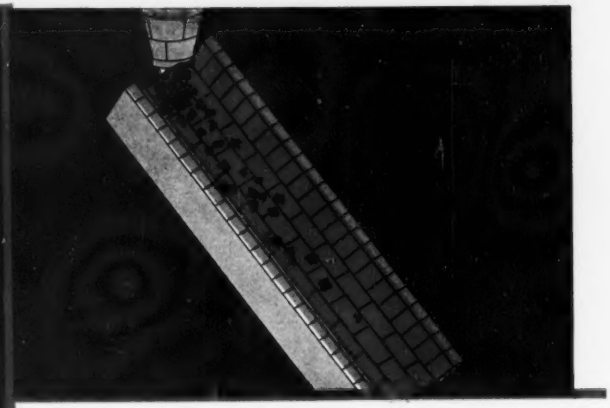
DU PONT

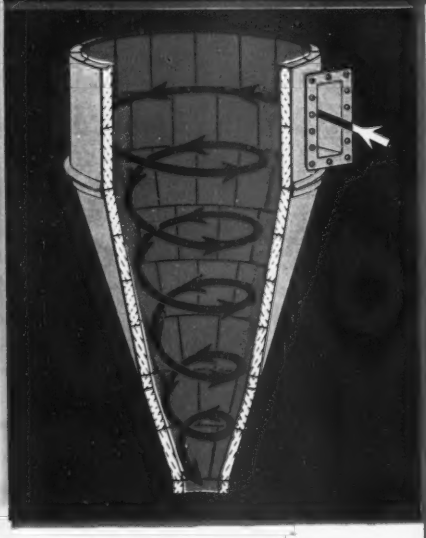
REG. U.S. PAT. OFF.

150th Anniversary

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY







ABRASION

Used under the toughest abrasion conditions known, our CARBOFRAX silicon carbide refractories or our MONOFRAX fused cast refractories have definitely outworn metals, paving bricks and other normally durable materials. For example:

In Cyclone Dust Collectors where the blast of millions of highly abrasive particles quickly cuts away other lining materials.

In Coke Chutes and Hoppers which must withstand punishing cascades of sharp-edged coke—sometimes fiery hot.

In Hot Blast Mains which carry high velocity gases that are laden with very abrasive dust.

In Billet Heating Furnaces where massive metal slabs are pushed or dragged across the furnace floor or other bearing surfaces.

Under conditions like these, regular lining materials or bearing surfaces are worn away in short order. Not so, these two Super Refractories. They last.

Granted, abrasion is seldom an isolated condition. It's usually abrasion *plus* . . . heat, or acid attack, or some other condition. But whatever the combination of conditions, chances are, there's a Super Refractory to fit the bill. For, as you can see (box, opposite page), these materials have many other properties equally as desirable in certain applications as abrasion resistance.

Super Refractories by

CARBORUNDUM

Trade Mark

Refractories Division — **Perth Amboy, N. J.**

"Carborundum", "Carbofrax" and "Monofrax" are registered trademarks which indicate manufacture by The Carborundum Company.

SUPER REFRACTORIES ARE ALSO USED

WHERE HEAT CONDUCTIVITY IS NEEDED. At elevated temperatures CARBOFRAX refractories conduct heat *almost as rapidly as chrome-nickel steels!* This characteristic is invaluable in checkers, muffles, hearths, radiant heating tubes, etc. It often radically increases the capacity of the equipment. There are also Super Refractories which are very good insulators, particularly at high heats.

WHERE CHEMICAL ACTION IS PRESENT. In general, all Super Refractories are either neutral or acid in nature. They are widely used where chemical inertness is important.

WHERE STRENGTH IS IMPORTANT. No commercial tonnage refractories have greater strength than Super Refractories. All can withstand over 300 psi at 2750° F without crushing. The modulus of rupture of one composition averages 3100 psi at 2460° F.

WHERE HIGH HEAT IS INVOLVED. They can be safely used at temperatures over 3000° F. They are very durable—are highly resistant to spalling and cracking. Some varieties are almost indispensable where flame impingement or violent temperature changes are present.

that will cut through metal

hardly touches these materials

They're the toughest known materials for large scale commercial use—so tough, they'll quickly wear out the best grinding wheels.

Have you any spots in your equipment that are vulnerable to abrasion? Areas that need constant relining or replacing? Then don't fail to investigate our CARBOFRAX bricks and shapes, and our MONOFRAX K blocks. Both materials give "armor-plated" protection. Both are extremely hard—within one index point of diamond hardness!

Possessing properties seldom associated with refractories, these, and other Super Refractories by CARBORUNDUM, are often used *regardless of whether high temperatures are involved.* Great strength and durability plus high resistance to heat, corrosion and abrasion, make them ideal for a wide range of applications.

It's surprising how often you'll find places in your equipment where Super Refractories are inherently better—and less expensive—than other materials. They're well worth investigating, particularly in this period of scarce critical materials.

Why not check up? Practically all Super Refractories are available as bricks or special shapes molded to close tolerances—including fitted joints, tubes, etc. Send today for our booklet describing the properties of these unique materials.

Information is now available on all the various groups of Super Refractories by CARBORUNDUM. Just send the coupon for our new booklet. No obligations, of course.

Dept. U-72
Refractories Div., The Carborundum Co.
Perth Amboy, New Jersey

Please send your free booklet describing the principal properties of Super Refractories.

Name_____

Position_____

Company_____

Street_____

City_____ Zone____ State_____

HEWITT-ROBINS

These Are The Results You Can Get Only With A HEWITT-ROBINS ORE MINE CONVEYOR

- First unit of its type to demonstrate successful ability to handle such things as *metallic* ore for stope and main haulage.
- All members specially designed for handling ore —including terminals and intermediate sections.
- Drop-in intermediate sections available in 8', 10' & 12' lengths and in widths 26", 30", 36", 42" and wider.
- A choice of 4 idler sizes—genuine Hewitt-Robins 4", 5", 6", & 7" idlers.

ONLY HEWITT-ROBINS IS ABLE TO TAKE SINGLE UNIFIED RESPONSIBILITY FOR A

PROOF...

This is an actual example of what you can do when you install a genuine Hewitt-Robins Ore Mine Conveyor underground . . .

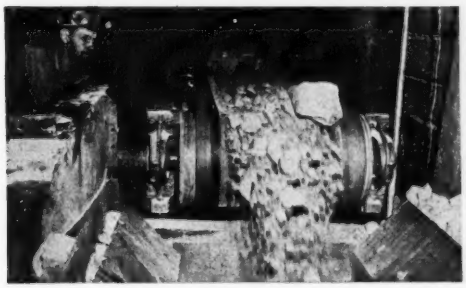
Conventional Methods Costly

A western copper mine operated three stopes by conventional methods in extremely heavy ground with rock highly altered and high moisture content. Ore moved from the stopes on short transfer raises, was bottomed in individual pony set chutes and drawn to haulage cars in a standard haulage drift.

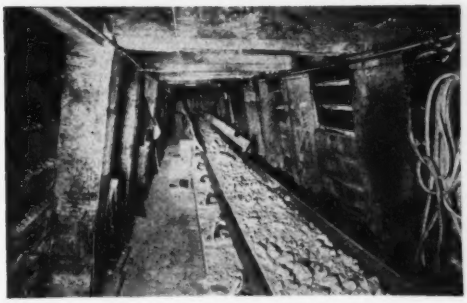
Results were not too good . . . costs were too high because of excessive weight conditions with track haulage. This method also limited the tonnage that could be drawn each 24 hours due chiefly to time out for haulage drift repairs. This, in turn, required that extraction openings be maintained at a high cost over too long a period.

The Hewitt-Robins Solution

To solve the problem, a 200-foot Hewitt-Robins Ore Mine Conveyor was installed as a lateral transfer unit in a sub-drift under the slusher and grizzly level.



The benefits were immediate. Faster, more uniform drawing was possible with less time exposure to excessive maintenance costs. And 1,400 to 1,600 tons/day were drawn compared with approximately 632 tons/day average in the best of the previous 3 stopes. Now, more blocks are being caved, using additional Hewitt-Robins Ore Mine Conveyors.



Simplifies Timber Repairs

Whereas timber repairs on the haulage levels formerly had to be done on a shift when the stope was down (because track operation interfered with repair crews) all necessary repair work in the conveyor drift can be done while ore is moving and the stopes are in full operation.

Simpler, faster train cycle operation is also possible. No longer is there the need to shop around from 4 pony set chutes to load out a 25-car train . . . haulage cars are loaded at the discharge end of the conveyor.

Greater Savings Possible

Mine operators can expect even greater continuity with the Hewitt-Robins Ore Mine Conveyor where the mine is completely conveyorized. For there the flow of material would be continuous from stope to surface.

Get the whole story—write for complete information today!

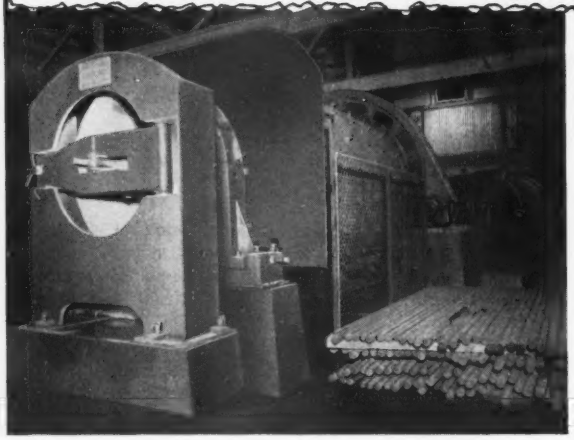
HEWITT-ROBINS INCORPORATED

STAMFORD, CONNECTICUT

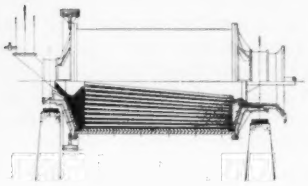
402 RANDOLPH ST., CHICAGO 6, ILL. **718 E. HOWARD ST., HIBBING, MINN.**

BELT CONVEYOR INSTALLATION—ONLY HEWITT-ROBINS MANUFACTURES BOTH MACHINERY AND BELT

How MARCY Rod Mills Improve Fine Crushing



MARCY OPEN END LOW PULP LINE GRINDING IMPROVES FEED FOR SECONDARY BALL MILLS



The Marcy principle of low pulp line, fast discharge of mill content results in lower overall costs than when dry crushing is used... the discharge is more uniform, a higher percentage of discharge is finished product. Thus the load is lightened or capacity increased, on the final stage of grinding.

For example

Large African Company Selects 7′ x 12′ Marcys for Fine Crushing

A large producer in Africa recently ordered 7—7′ x 12′ Marcy Open End Rod Mills for fine crushing a copper-lead-zinc ore. They will handle 13,500 metric tons per 24 hours—1″ feed to 10 mesh product. The rod mills will discharge to ball mills which are already in operation.

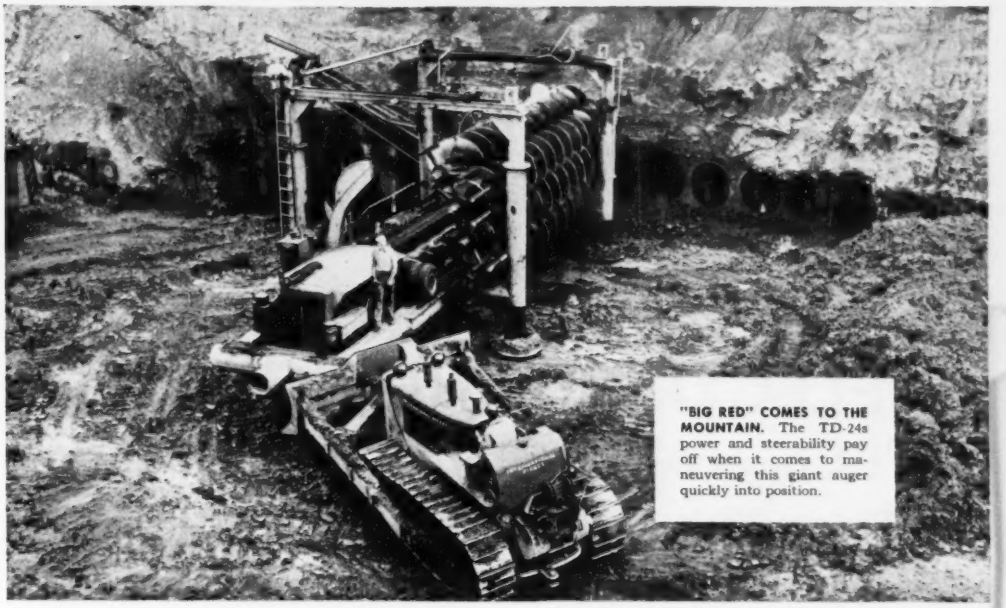
Other MASSCO products: Massco-Fahrenwald Flotation Machines, Genuine Wilfley Tables, Massco-McCarthy Hot Millers, Rock Bit Grinders, Density Controllers, Belt Feeders, Rubber Pinch Valves, Assay and Laboratory Supplies and Equipment, Complete Milling Plants.

The Mine & Smelter Supply Co.

BOX 5270, TERMINAL ANNEX, DENVER, COLO., U.S.A.
OFFICES IN SALT LAKE CITY, EL PASO, 1775 BROADWAY, N. Y. C.

REPRESENTATIVES: CANADIAN VICKERS, LTD., MONTREAL, CAN.; W. R. JUDSON, SANTIAGO, CHILE; THE EDWARD J. NELL CO., MANILA, P.I.; THE AUSTRAL OTIS ENG. CO., LTD., SO. MELBOURNE, AUSTR.; MORGARDSHAMMARS MEK. VERKSTADS AKTIEBOLAG, MORGARDSHAMMAR, SWEDEN; THE ORE & CHEMICAL CORPORATION, 80 BROAD STREET, NEW YORK CITY 4, NEW YORK, REPRESENTATIVES FOR CONTINENTAL EUROPE.

TURNS with POWER ON BOTH TRACKS



"BIG RED" COMES TO THE MOUNTAIN. The TD-24s power and steerability pay off when it comes to maneuvering this giant auger quickly into position.

"Big Red's" exclusive steering system pays off big at West Virginia mine

To save manpower and get the coal out faster, Compass Coal Co. of Phillippi, West Virginia, uses a huge drill rig to produce 300 tons a shift.

An International TD-24 crawler moves the rig around, and also builds roadways. For both these jobs, the TD-24 is the Champ for sure. Because it has 148 *drawbar* horsepower—more than any other crawler on the market—and because *it can turn with power on both tracks.*

Some tractors can pivot-turn and feather-turn with all power on the outside track. Others can make gradual turns with power on both tracks. But only International Planet Power Steering gives you all three turns in one tractor—the Big Red TD-24.

Get the details from your International Industrial Distributor. Ask him too about his major shop facilities and fast field service. Get the whole low-down—and you'll be a TD-24 man yourself from then on in!

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

INTERNATIONAL HARVESTER

INTERNATIONAL

POWER THAT PAYS

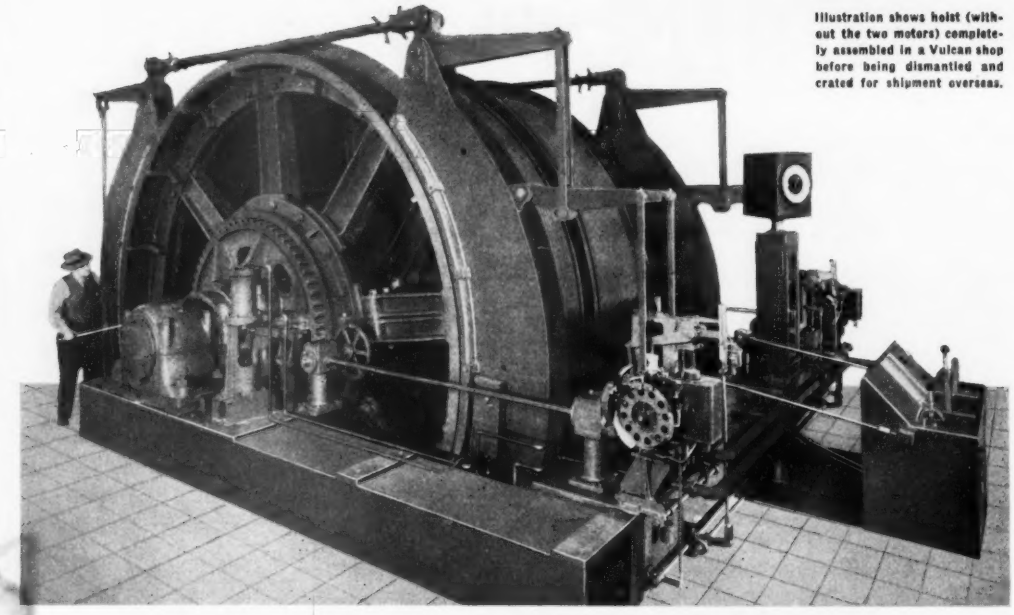


Illustration shows hoist (without the two motors) completely assembled in a Vulcan shop before being dismantled and crated for shipment overseas.

ELECTRIC MINE HOISTS

Don't Come Any Better — or Much Larger Than This Recent Vulcan Product

Part of an order for more than a million dollars worth of Vulcan equipment to help develop the mineral resources of a friendly foreign country, the big electric hoist shown above has "everything" to promote fast, safe, economical operation. Weighing approximately 420,000 lbs. it will be driven by two 1250 hp. A. C. motors through single-reduction herringbone gears which are completely enclosed in an oil-tight steel casing.

The two "Built-Up" all-steel drums, 18 ft. in diameter and 4 ft., 3 in. in width, will each carry approximately 2500 ft. of 1¾" rope in two layers. One drum is equipped with a positive toothed-type clutch, for balanced hoisting from any one of three levels in a shaft 800 meters deep. Each drum is equipped with powerful post-type parallel-motion brakes operated by oil-hydraulic brake engines and controlled by modern safety devices which provide dependable protection against any damage that might otherwise be caused by current failure or by errors on the part of the operator. Brake and clutch on the loose drum are mechanically and electrically interlocked.

The main shaft and both of the two pinion shafts are mounted on self-aligning spherical roller bearings. Other modern features include gear-driven micrometer depth indicators, a trip recorder, a recording tachometer and centralized control at a steel desk.

Not many Vulcan hoists are as large as this one but all are engineered just as carefully and built just as accurately. Many different types and sizes, from 5 hp. up, are illustrated and described in Bulletin A-407. Write for a free copy and tell us about your hoisting requirements. Our engineers welcome opportunities to make helpful suggestions without charge or obligation.

Vulcan Iron Works

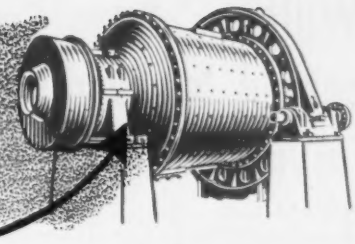
Established 1849

WILKES-BARRE, PA., U.S.A.

New York City Office, 50 Church Street

DESIGNERS AND BUILDERS OF ELECTRIC HOISTS, "ALLCASTSTEEL" SHEAVES, CAGES, SKIPS, GUNBOATS, ETC., UNDERGROUND CONVEYORS AND ALL TYPES OF LOCOMOTIVES FOR BOTH UNDERGROUND AND SURFACE HAULAGE

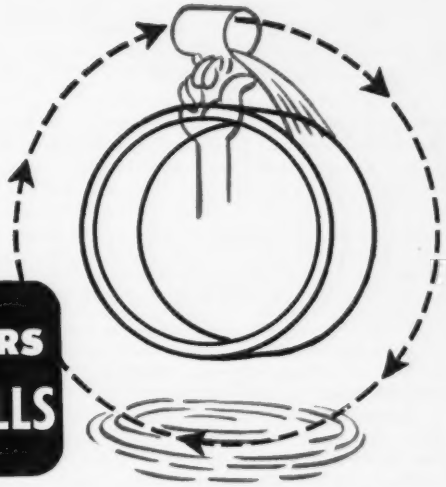
"Inside Story"



of Allis-Chalmers Oil Lubricated Trunnion Bearing...

AN OILING BUCKET inside this Allis-Chalmers trunnion bearing revolves with the trunnion . . . lifts oil from the reservoir in the bottom of the bearing housing to an oil distributing pan above the bearing. From here it floods down onto the bearing, lubricating the full face of the bearing uniformly and continuously.

You'll always have the comforting assurance that the all-important trunnion bearing on your mill is being dependably lubricated. This assured protection of internal lubrication is standard on all Allis-Chalmers oil lubricated bearings — even on installations where a separate external oiling system is used. A-3722



ALLIS-CHALMERS
GRINDING MILLS

These protective features of A-C trunnion bearings also give you savings in power and maintenance —

- ★ An improved seal keeps dirt out of oil and has been designed to provide for mill expansion.
- ★ A hand operated, high pressure lubricant pump "floats" the mill after shut-down . . . eliminates dry starting.
- ★ If desired, an external system for filtering and cooling can be added to the internal oiling system.

Get more facts from the Allis-Chalmers representative in your area, or write for Bulletin 07B6718A. Allis-Chalmers, Milwaukee 1, Wis.

ALLIS-CHALMERS

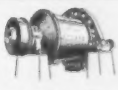
Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

Hammermills

Vibrating Screens

Jaw Crushers

Gyratory Crushers



Grinding Mills

Kilns, Coolers, Dryers

Williams' Titan Crusher served by custom-built Farval centralized system

THE lubrication problem was this: How to keep the rotating spindle bearings on the novel crusher (at right) working dependably and efficiently in an important ore preparation plant.

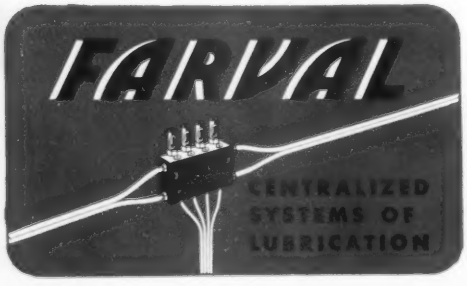
The plant engineers knew that pulverizing and crushing stubborn flint-like ore creates tremendous bearing pressures and that meant that constant lubrication care was a must. They also knew that getting a lubrication system onto a rotating portion of a machine had always presented a ticklish problem. Yet, to stop the machine for guess-and-by-gosh hand oiling meant production hours wasted and, at best, a hit-or-miss lubrication job.

To cope with the special problems presented by this ore crusher, Farval engineers were called in and soon came up with a modern custom-built solution for lubricating constantly moving bearings. In a unique rotating connection and by means of tough, flexible hoses and a reversing element, the Farval Centralized Lubrication System was tailored to body-fit the gyrating portions of the crusher. This practical approach to machine preventive maintenance saves time and men, saves lubrication (as high as 75%) and most important, increases production.

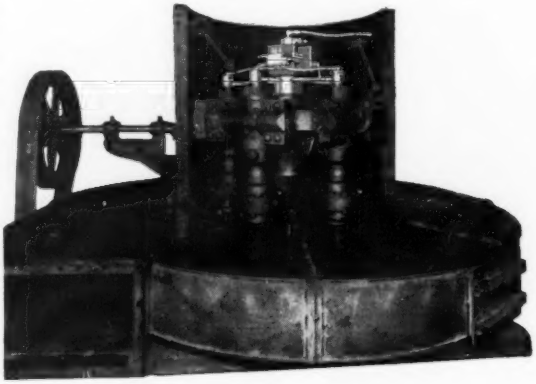
Farval has proven itself in 25 years of service to industry. It is the original Dualine system of centralized lubrication. The Farval valve has only two moving parts —is simple, sure and foolproof, without springs, ballchecks or pinhole ports to cause trouble. Through its wide valve ports and full hydraulic operation, Farval unfailingly delivers grease or oil to each bearing—as much as you want—as often as desired. Indicators at every bearing show that each valve has functioned.

In or near your city, there is a Farval engineer ready to serve you with your special or conventional lubrication problems. Write now for Bulletin 25 and a full description of the Farval system at work. The Farval Corporation, 3281 E. 80th St., Cleveland 4, Ohio.

Affiliate of The Cleveland Worm and Gear Company, Industrial Worm Gearing. In Canada: Peacock Bros. Ltd.

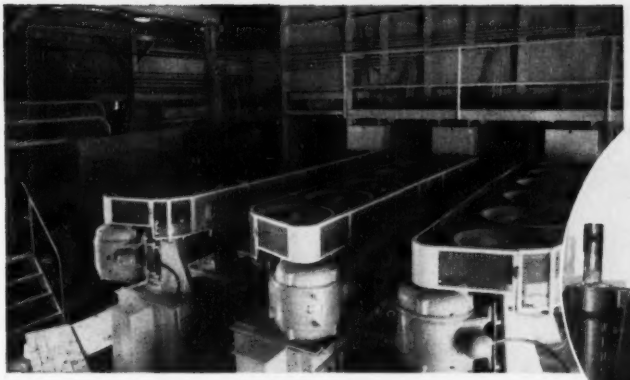


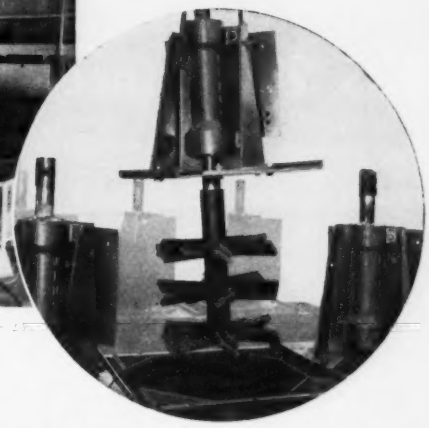
FARVAL—*Studies in Centralized Lubrication* No. 135



KEYS TO ADEQUATE LUBRICATION—*Whenever you see the sign of Farval—the familiar valve manifolds, dual lubricant lines and central pumping station—you know a machine is being properly lubricated. Farval manually operated and automatic systems protect millions of industrial bearings.*

Illustration by courtesy of Williams Patent Crusher and Pulverizer Co.





Get Higher Recovery— Improved Quality— with the **WEMCO** *ATTRITION MACHINE*

Here is a **new** machine that gives you an economical — a **profitable** solution to two important problems:

1 *Efficient processing of ores and industrial sands having excessive surface coatings.*

2 *Liberation of cemented materials.*

If either of these problems exists in your operations, the WEMCO ATTRITION MACHINE will give you improved quality of your product or higher recovery at a given quality.

RECOVERIES INCREASED AS MUCH AS 3 TIMES!

- Actual pilot plant tests of attritioning on the retreatment of tungsten tailings improved recovery from 22% to 68%!
- Similar tests on reflotation of gold from rejects increased recovery from 20% to 65%!
- Glass sand recovery by flotation after attritioning increased from 80% to 95%!

The wide adaptability of the WEMCO Attrition Machine has been proved by actual plant operation and pilot plant tests. Here are a few examples of results obtained:

Tungsten ore — Substantial improvement of flotation grade and recovery in the retreatment of former tailings.

Uranium ores — Liberation of uranium minerals in the cementing material of sandstone.

Glass sand production — Removal of iron oxide stain to meet market specifications.

Aggregate and sand production — Disintegration of sand and clay cementing material from aggregate, saving both aggregate and sands for marketing.

Sulfide ores — Removal of semi-oxidized coatings, making possible flotation recovery — by removal of reagent and oxide coatings on former tailings.

PRINCIPLE OF OPERATION

By controlled turbulence of high density pulps, the WEMCO Attrition Machine thoroughly abrades mineral and ore particles. The imparted action is decidedly more efficient and complete than similar treatment previously attempted by other methods. Power consumption is greatly decreased, averaging 3½ to 7 kw. per ton of capacity. Maintenance and replacement costs are lowered to approximately 1 cent per ton of output.

APPLICATIONS

Treatment of Particle Surfaces

Removal of oxidized coatings
Elimination of slime coatings
Removal of reagent coatings
Surface polishing of particles

Liberation of Cemented Minerals

Ores and industrial minerals of this type may be separated, either the particles or the cementing material being recoverable for valuable mineral content.

Write today for full information on this ***new*** *metallurgical tool and on WEMCO's facilities for conducting laboratory tests on* ***your*** *ore dressing or Sand preparation problem.*

WEMCO
WESTERN MACHINERY COMPANY
760-768 FOLSOM STREET · SAN FRANCISCO 7, CALIFORNIA

OTHER **WEMCO** PRODUCTS
Mobil-Mills • Coal Spirals • HMS Thickeners • HMS Pumps • Sand Pumps Cone Separators • Drum Separators • Fagergren Laboratory Units • Agitators Fagergren & Stalfenson Flotation Machines • Hydroseparators • S-H Classifiers HMS Laboratory Units • Dewatering Spirals • Thickeners • Conditioners • Densifiers

Unique 4 Belt Drive Fits 2¼" Space

Transmits 34 h.p. to Operate Hydraulic Controls . . .

Unless they made costly changes, the Gerlinger Carrier Co., makers of big fork lift trucks, had only 2¼" on the crankshaft available for the hydraulic pump drive.

A standard V-Belt drive to carry a load up to 34 horsepower would have required 5½". It appeared that a chain drive was the only type that could handle the load and fit the space. Early trucks, therefore, were equipped with chain drives on the hydraulic pumps.

In service, however, chains gave trouble. It was impractical to encase them and their speed was so high (3000 ft./min.) that they threw off all lubricants, and wore out rapidly. Gates engineers were asked for a solution.

Drawing upon a background of more that 20 years of *Specialized* Research in V-Belt engineering, Gates engineers worked out a drive using four small specially designed V-Belts. This drive fits into the crowded space between engine and fan belt and yet has ample capacity to handle the heavy load.

V-Belt drive has many advantages

Unlike the chain drive, V-Belts require no lubrication, yet are quiet and positive and the multiple strands are an advantage because they assure uninterrupted operation. If one belt breaks, the others continue to carry the load until replacement can be made. A further advantage is that the early lift trucks can be equipped with the new drive at a minimum cost.

This is another example of the practical value of Gates engineering know-how applied to a critical design problem. Only rarely, of course, are special V-Belts required to solve such a problem, but the same engineering skill and experience is available to you—right in your own plant—for the solution of *any* power transmission problem you may have.

This V-Belt Drive Is Another Practical Example of Gates Specialized Research

Phone for a Gates Field Engineer

Whenever you have a difficult drive to design—or if some difficulty develops on any drive in your plant or if you only want to know what V-Belts to use for the most efficient, lowest cost service on any particular drive—just pick up your phone book and call the number listed under "Gates Rubber."

A Gates field engineer will call on you and put at your service all the facilities of Gates *Specialized* Research on V-Belts—*without the slightest obligation.*

There are Gates engineering offices and jobber stocks in all industrial centers of the U.S. and 71 foreign countries.

The Gates Rubber Company • Denver, U.S.A.

®

The World's Largest Maker of V-Belts

Gates VULCO ROPE DRIVES

This modern machine is next to infallible—yet even so, the Bethlehem operator checks the reduction of his wire.

His attention to detail means better rope for you

Wire-drawing is a fundamental step in the making of Bethlehem rope, and it's done on machines that almost never make mistakes. Nevertheless, this operator, like others in the Bethlehem mill, runs frequent checks on the work going through. He wants to be sure that his part of the job meets the specified standards—which are very, very high.

This care, this attention to detail, is not confined merely to the drawing of wire. It begins with the making of the steel used in Bethlehem wire rope, and it carries through each and every step to the final inspection and reeling.

Care is a lot of *little* things which, taken together, mean a quality product. It is one of the reasons why you cannot buy a better rope than Bethlehem makes.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

When you think WIRE ROPE . . . think BETHLEHEM

Time to light another candle...

It was 1802...150 years ago... when Eleuthère Irénée du Pont de Nemours began making black powder in a fieldstone mill along the banks of Brandywine Creek near Wilmington, Delaware.

Research...experimentation...even then held a place of high concern in the development of a product soon known for its superior quality. From that humble beginning, so significant of the way of life in this new country, research has constantly played an important part in the colorful history of the Du Pont Company.

ONE HUNDRED YEARS passed. In 1902 . . . now half a century removed . . . Du Pont established Eastern Laboratory at Gibbstown, New Jersey. It was one of the first in the United States to be entirely devoted to industrial research. Here, old products were improved; new ones developed and perfected. And as always, consumers, technical representatives and the laboratory's chemists, physicists and engineers cooperated in the work. The keynote was progress. Today, such research has become an indispensable, integral part of Du Pont's continuing program of product improvement. Laboratory facilities now embrace over 75 buildings, a proving ground of some 3600 acres and an experimental tunnel and mine.

MANY INDUSTRIES have benefited from these untiring efforts. In the field of ore mining alone, an imposing list of product developments contributed largely to the advancement of the industry. Men now long engaged in the mining of ore may well recall the introduction of some of these. Younger men will recognize other, newer products of Du Pont Explosives Research. Among these contributions to a basic industry are the following:

DU PONT PRODUCTS OF EXPLOSIVES RESEARCH

- Low-freezing dynamites
- Ammonium nitrate dynamite
- Low-density ammonium nitrate dynamites
- Ammonium nitrate Gelatins
- Minimum fumes Gelatins
- Hi-Velocity Gelatins
- "Nitramon"
- "Nitramex"
- Electric blasting cap shunts
- Tetryl caps
- All-metal delays
- Rubber plugs in electric blasting caps
- Shielded shunts
- Plastic insulation on electric blasting cap wires
- Static resistant electric blasting caps
- Superior Crimper
- Detect-A-Meter
- Safety Blasting Switch
- Blasting Timer
- Primacord Boosters
- Primacord "MS" Connectors
- Condenser Discharge Blasting Machine

BUT what is new today may become obsolete tomorrow, next week or next year. That is why the job of research never ends. And constant research is why Du Pont Explosives have earned world-wide recognition. For 150 years they have met the specialized needs of the mining industries and of the men whose work requires dependable performance in a wide variety of products. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

Du Pont Explosives

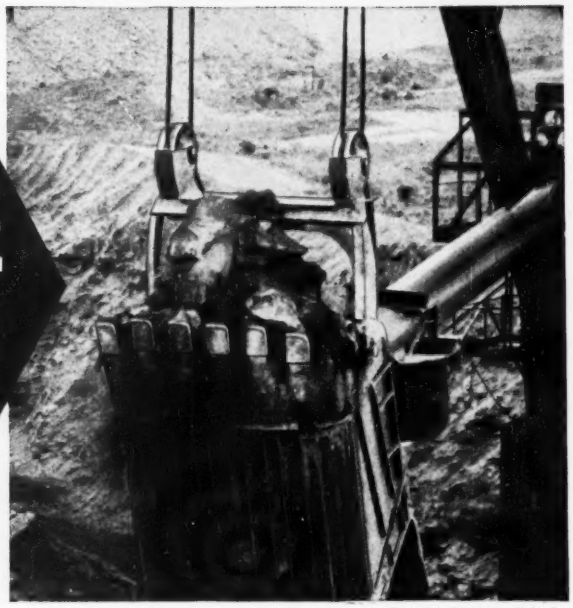
Blasting Supplies and Accessories

DU PONT
REG. U. S. PAT. OFF.

150th Anniversary

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

PERFORMANCE HERE DEPENDS ON THIS



Courtesy Bucyrus - Erie Co.

A measure of a shovel's efficiency is the size of its bite. But of equal importance is the length of time the shovel will keep on biting. That is why the trailing cable that transmits power to the shovel should be as good as you can buy. Compared with the cost of the shovel or other material-handling equipment, the cost of the trailing cable is insignificant. Yet a breakdown in this cable can have a disastrous effect on your cost. Nothing but the best is good enough.

TIREX Cables are first-quality cables. They are engineered for tough, long-lasting service. Service records covering many years prove that they give the service expected of them.

Whether the service is on a slusher hoist, a cutting machine, a continuous miner, or a stripping shovel, there is a size and type of TIREX Cable to fit every job. Whenever you need a portable cord or cable specify and be sure that you get Simplex-TIREX Cords or Cables. There are none better made.

SIMPLEX TIREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

longer service from Tungsten-Carbide Bits

The CP Airleg provides a rigid, well-balanced support for the drill and effectively absorbs all recoil. A CP ratchet throttle (exclusive) maintains balanced feed leg pressure and keeps the bit in constant contact with the rock. This fine balance of feed pressure prevents "slapping," and minimizes the danger of fracturing tungsten-carbide bits.

Available in 1⅞" and 2⅛" feed cylinder diameters, and with 36" and 48" feed travel, the Airleg is ideal for use with CP Sinkers, particularly the general utility, 45 lb. class CP-32 and the 55 lb. class CP-59.

Write for detailed information.

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

Fiftieth ANNIVERSARY

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Freedom is on the march!

The freedom America celebrates on the Fourth of July has a special significance to anyone in the Western world whose life work in mining or metallurgy has contributed to our ever-increasing supply of strategic minerals.

But freedom to march resolutely ahead must be—and now is—amply possessed of the metal sinews with which to defend its security and expand its benefits to all.

To help achieve this end, Cyanamid has devoted over three decades of research to product and process development and application—first in Cyanidation, then in Froth Flotation, and latterly in Processes for Separation by Specific Gravity Differences.

Consider iron ore, the cornerstone of our industrial civilization.

Tremendous new bodies of high-grade ore have been discovered and are being developed. But, equally important, beneficiation of lower-grade ores by Heavy-Media Separation, the Dutch State Mines Cyclone Separator and Froth Flotation is indefinitely prolonging the economic life of the Range and opening new vistas for beneficiating iron ore deposits world wide. Witness results recently reported on fine-ore beneficiation (¼" x 65 mesh) at a western Mesabi concentrator using two 12" Dutch State Mines Cyclone Separators capable of treating 125 tons per hour. Concentrate from feed containing 48.6% Fe and 26.5% SiO_2 assays 60.0% Fe with SiO_2 as low as 10.1%, a practical duplication of heavy-liquid results with power consumption and medium loss acceptably low.

Equally noteworthy advances are being made in base-metal and non-metallic concentration. New reagent combinations and better treatment methods (alone and in combination with Processes for Separation by Specific Gravity Differences) are expanding the output of such strategic minerals as antimony, chromite, cobalt, industrial diamonds, fluorspar, manganese, molybdenum, sulphur, tin and tungsten.

Specialized reagents – such as Aerofloat 226 and 213 and Cyanamid 400, 600 and 800 Series Reagents – added to traditional reagent combinations are helping to produce higher grade concentrates at economic costs, particularly in the treatment of oxidized lead ores and complex sulphide ores. New Cyanamid Reagents and processes in advanced stages of development promise to provide unique new methods for increasing recoveries of strategic minerals.

To help you capitalize on these developments, we have prepared resumes of current practice and avenues of approach to better beneficiation. These special technical bulletins are practical guideposts to progress in solving beneficiation problems. They are offered without obligation, as a preliminary to discussion with Cyanamid Field Engineers, located in all important mining districts. The Cyanamid Mineral Dressing Laboratory staff is also available for consultation on your particular problems.

Mineral Dressing Division **AMERICAN CYANAMID COMPANY** 30 Rockefeller Plaza, New York 20, N.Y.

I have a particular interest in the treatment of:

☐ ANTIMONY ☐ CHROMITE ☐ COBALT ☐ DIAMONDS ☐ FLUORSPAR
☐ MANGANESE ☐ MOLYBDENUM ☐ SULPHUR ☐ TIN ☐ TUNGSTEN

Kindly send Technical Bulletins on the beneficiation of these minerals and data on

☐ CYANAMID REAGENTS ☐ HEAVY-MEDIA SEPARATION PROCESSES
☐ DUTCH STATES MINES CYCLONE SEPARATOR PROCESSES

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COMPANY_____

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Printed in U.S.A.

AMERICAN *Cyanamid* COMPANY

MINERAL DRESSING DIVISION

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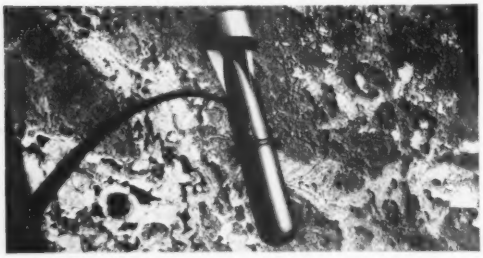
LATIN AMERICA: *Aero crews are executing large scale aerial mapping-magnetometer surveys here.*

MIDDLE EAST: *Aero's B-17 maps at over 30,000 feet for important reconnaissance studies.*



CANADA: *More than 100,000 sq. mi. in Alberta have been mapped by Canadian Aero, Ottawa.*

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Get Reconnaissance Facts Faster and Cheaper with the Geologists' Most Helpful New Exploration Tools

Before you begin *footslogging*, you can get direct, useful data with air surveys. Mapping cameras record the surface geology in detail. And the airborne magnetometer provides important information—so direct that claims have been staked from the raw magnetic records in some cases. This tested new instrument has greatly helped in locating new finds of magnetite, ilmenite, asbestos and other minerals. Together, these air survey instruments can advance your exploration plans by months and years.

Here's half a million miles of air surveys to help you

Today, busy Aero crews—with half a million miles of exploration experience—are available for contract work anywhere. We are now completing contracts and have crews on hand for new surveys in South America . . . Africa . . . Central America . . . Middle East . . . Western Canada . . . United States.

In the early stages of planning your next project, let Aero's technical staff bring our worldwide aerial mapping experience to your discussions. We can carry forward your exploration at a fraction of the cost of ground reconnaissance.

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A thousand and one wire ropes
PREformed and internally lubricated

The experience of hundreds of users—like yourself—goes into the making of Macwhyte Wire Rope. For more than half a century, their needs and yours have been studied by our engineers to produce the best wire rope for each job.

There are a thousand and one ropes to choose from. Recommendations are promptly available from Macwhyte distributors or Macwhyte Company.

Macwhyte Company, 2937 Fourteenth Avenue, Kenosha, Wis. Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel Wire Rope and Wire Rope Assemblies. Mill depots: New York • Pittsburgh • Chicago • Minneapolis • Fort Worth • Portland • Seattle • San Francisco • Los Angeles • Distributors throughout U.S.A.

Catalogs are available on request

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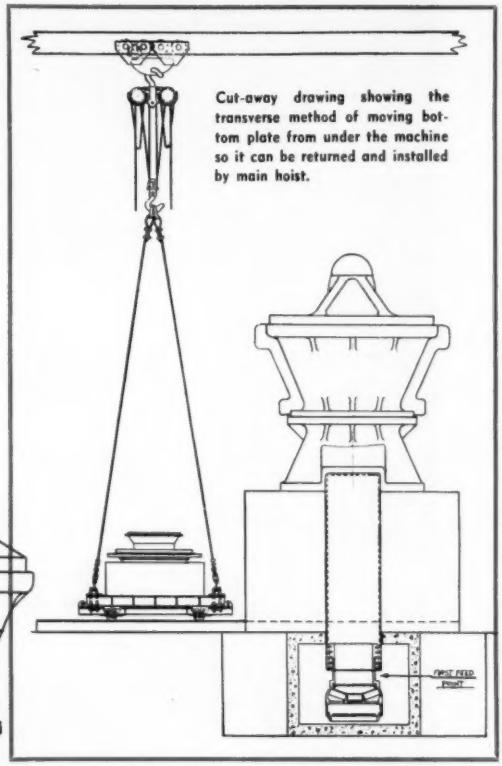
AGAIN... KENNEDY



Cut-away drawing showing the transverse method of moving bottom plate from under the machine so it can be returned and installed by main hoist.

Please observe that the hoist for erecting the crusher is also used to raise and lower the bottom plates with wire ropes. Undependable operation of hydraulic jacks eliminated and crusher erected in 10 minutes by this method.

The reinforced concrete floor acts as a screen to prevent any dust from getting into moving parts of crusher or motor.

Exhaust, carrying air to remote points.

PRESENTS AN INNOVATION IN CRUSHING EQUIPMENT!

NEW GYRATORY CRUSHER WITH DUAL DISCHARGE OUTLETS INCREASES OUTPUT AND EFFICIENCY

Only KENNEDY has the correct answer to the "Sticky Ore" problem! KENNEDY Gearless Gyratory Crushers are now built with TWO DISCHARGE OUTLETS plus an exclusive "No-Stick" feature that increases efficiency and output. This distinct innovation in crusher design is another "FIRST" for the world-famous line of KENNEDY crushing equipment.

CHECK THESE EXCLUSIVE FEATURES

Synchronous motor built into pulley assembly

★

Smooth frictionless operation because the crusher is gearless

★

Power used ONLY for crushing

★

All moving parts carried on self-aligning roller bearings

★

KVS forced-feed oiling system pumps four barrels of oil per hour through bearings without waste

★

Eccentric and ball are spray babbited. NONE has been rebabbited in over three years

Hard-to-crush rock and ore such as limestone, trap rock, basalt, taconite, slag, etc., containing as high as 50% clay, can be handled without sticking or clogging by the exclusive KVS process.

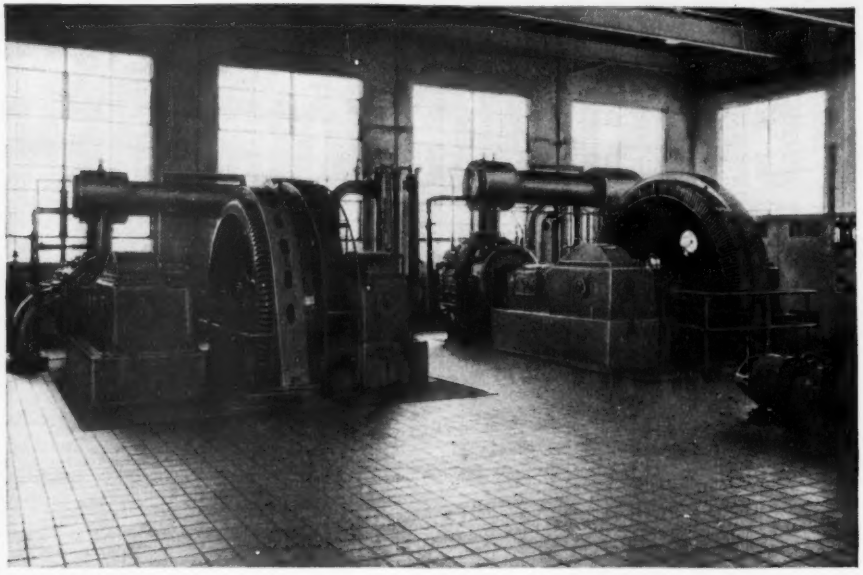
No other crusher offers this advantage. Double discharge outlets, built at angle of 70 degrees, assure uninterrupted delivery of material. Other crushers, with single 42 degree outlets, cannot compare because the discharge outlet becomes clogged with sticky clay or taconite ore.

In the new KVS crushers, rock and ore pass through mantle and concaves at bottom. A vertical drop of 6 feet then quickly and surely disgorges sticky clay, etc.—greatly speeds production by eliminating clogging —saves countless man hours clearing stalled crushers.

Send for bulletins describing all types of KVS crushers.
Let us prove that "It Costs Less To Own The Best".

IT COSTS LESS.. TO OWN THE BEST!

KENNEDY - VAN SAUN
MANUFACTURING & ENGINEERING CORPORATION
TWO PARK AVENUE, NEW YORK
FACTORY DANVILLE, PA.



meet AIR DEMANDS economically

with O-CE COMPRESSORS, built for continuous, heavy-duty operation — in sizes up to 2,000 hp., for pressures to 5,000 lbs.

Of horizontal, double-acting, water-cooled type, with direct-mounted synchronous motor drive, these compressors are unsurpassed for dependable, low-cost performance.

- ✓ Equipped with roller bearings throughout.
- ✓ Quick-acting Simplate valves minimize power consumption.
- ✓ Large, stream-lined air passages make air flow resistance negligible.
- ✓ CP Multi-Step Control handles partial load demands economically.
- ✓ CP Automatic Starting Unloader completely unloads compressor when starting and stopping, and permits automatic restarting after power failure.
- ✓ CP Intercooler assures maximum heat transfer with low water consumption.

Write for full information.

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PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
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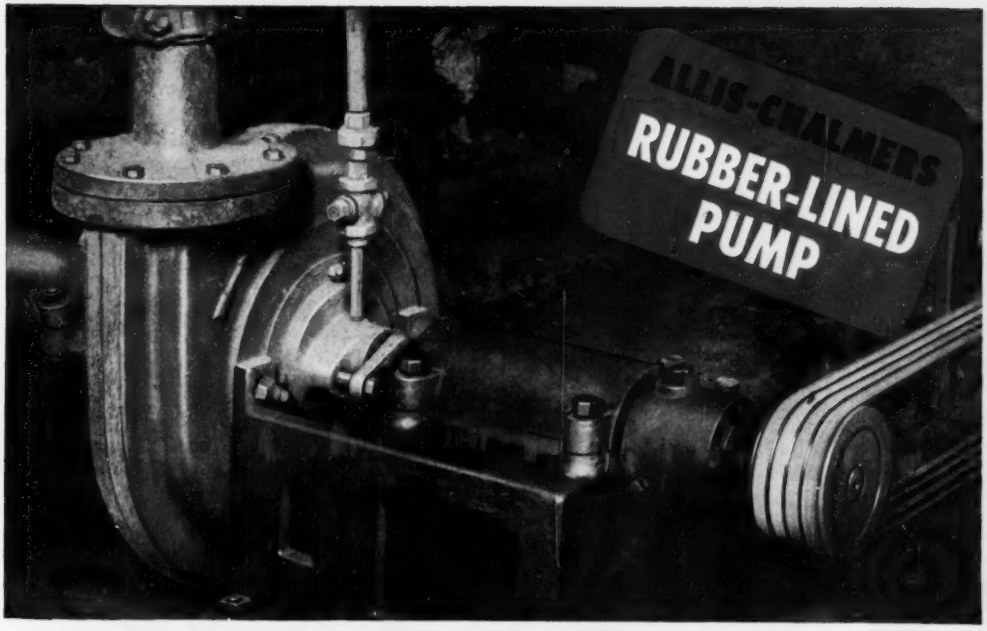


UP TO 50 Times Longer Life

HANDLING FINE MESH MATERIALS

PERFORMANCE RECORDS FROM FIFTEEN YEARS of handling all types of slimes, slurries and other fine mesh abrasive suspensions show definite savings from the use of Allis-Chalmers type SRL Rubber-Lined Pumps. Instances of 10 to 50 times the life of the finest alloy pumps built for this service are not uncommon. Not only are pumping costs reduced, but production lost from shutdowns is almost eliminated and standbys often can be done away with.

Unique Lining Method

The rubber lining of the Allis-Chalmers SRL Pump is bonded to a heavy steel skeleton which is simply fitted into the casing. The lining and the casing are not bonded together. When the lining finally must be renewed, the pump need not be dismantled and removed from its location. Replacement cost is kept to a minimum.

Each Installation Specially Engineered

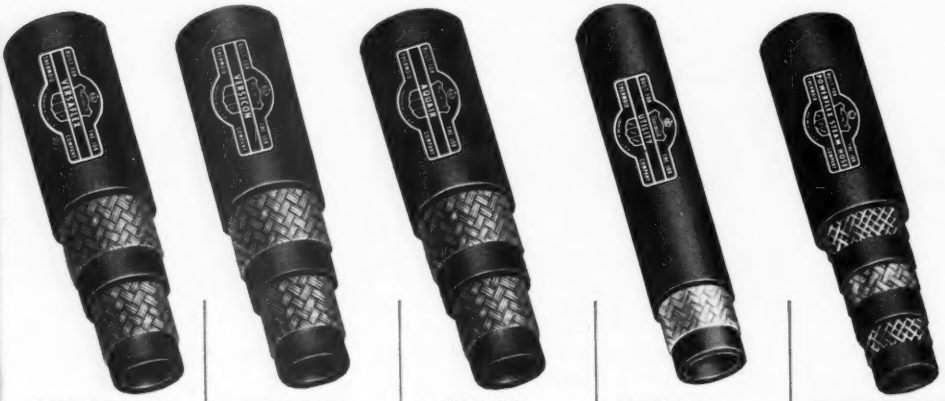
Every pump is individually engineered to provide the best possible performance for the application involved. Special rubber linings of various compounds are available to handle a variety of slurries at low per-gallon pumping cost.

If you are handling sand, taconite, grinding mill discharge, tailings or any other abrasive slime or slurry, ask your Allis-Chalmers representative to show you how you can get long pump life and low cost per gallon pumped. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, and ask for Bulletin 08B7311. A-3698

ALLIS-CHALMERS

now! 5 basic types of Thermoid hose do the work of eighteen!

The new Thermoid line of molded hose cuts handling time and storage costs 70% or more in a wide variety of industrial and commercial uses! Thermoid's "Basic Five": Versaflex . . . Versicon . . . Aquair . . . Utility . . . Powerflex . . . now combine simplification and versatility with Thermoid top quality construction. And Thermoid's new standard color identification eliminates confusion in storage and stock selection!



VERSAFLEX

Multi-purpose hose built to withstand higher pressures. Recommended for butane, propane, insecticides, etc. Color code: *Red.*

VERSICON

A true all-purpose hose for virtually every type of air, gas or liquid. Color code: *Brown.*

AQUAIR

Rugged, dependable hose for handling air, water, welding gases. Color code: *Green*.*

UTILITY

Most practical hose for air, water and illuminating gases at pressures from 75 to 125 psi. Color code: *Black.*

POWERFLEX

Designed specifically for super heated steam at pressures from 100 to 200 psi. Color code: *Black.*

You can definitely simplify your buying, inventory, storage and stock selection with Thermoid's color-coded "Basic Five". Get full information from your distributor or write direct for Hose Catalog No. 3680. It's yours for the asking.

**Also furnished with Red Cover for acetylene*

Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

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Rubber Sheet Packings • Molded Products
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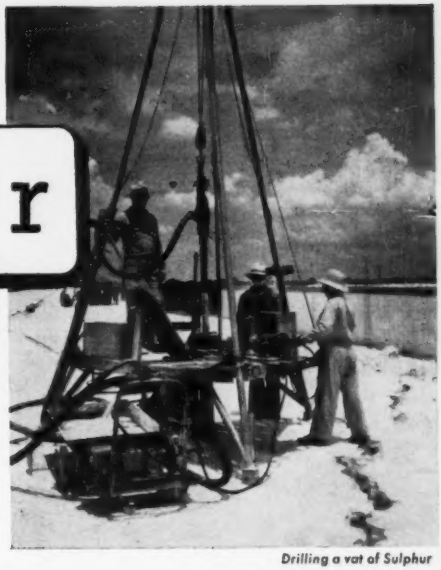
Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

Sulphur



Drilling a vat of Sulphur preparatory to blasting down

Thousands of tons mined daily, but where does it all go?

All through the open seasons—spring, summer and fall—homes everywhere are being painted, old houses as well as new getting much needed protection from the elements. It's an activity seen by millions but few realize how important Sulphur is to this phase of our domestic economy. Actually, it's an essential commodity.

That's right. Paint pigments constitute one of the largest individual consumers of Sulphur . . . in the form of sulphuric acid. Government statistics show that for the year 1950 some 1,260,000 tons of 100% H_2SO_4 were consumed by producers of lead, zinc and titanium pigments. Translated into Sulphur, this means around 400,000 long tons which is a lot of Sulphur! In fact, the pigment industry stands 5th on the list of the many industries that consume Sulphur in one form or another during their manufacturing processes.

The Sulphur Industry indeed has many mouths to feed, all important to our economy and standard of living.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

Times Have Changed . . .

HAND STEEL ON HARD ROCK
Missouri lead mine—about 1890. It took strength to swing the hammer, nerve to hold the bit, and skill to place the holes.

An enlargement of this photo suitable for framing is yours for the asking.

Many practices once considered the last word in progress have gone the way of hand steel. Today, the demand for ore calls for making the most of every new development in blasting methods.

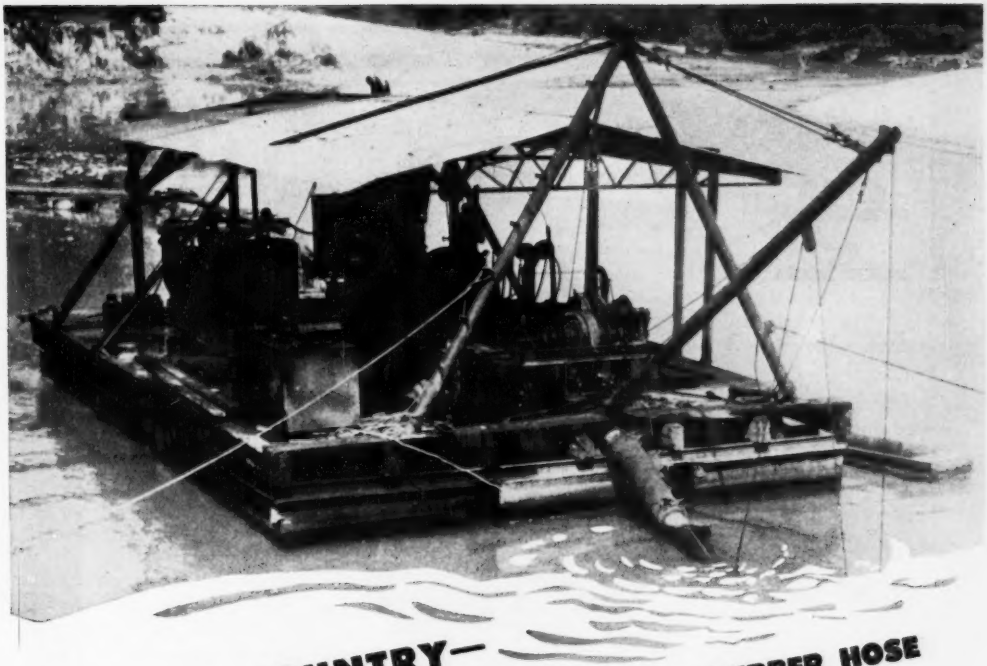
The latest major development in underground blasting techniques is the use of milli-second delay detonators—pioneered by Atlas in the ROCKMASTER® Blasting System. Correctly applied, the one-two punch of split-second detonation gives breakage never before possible in hard rock mining. And there's no substitute for good breakage to assure maximum production at minimum cost from loading, hauling, and crushing equipment.

It will pay *you* to investigate the advantages of the ROCKMASTER Blasting System. Send for the valuable 20-page booklet on ROCKMASTER blasting that is yours for the asking.

ATLAS EXPLOSIVES
"Everything for Blasting"

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*



IN BAYOU COUNTRY—

CONSTRUCTION BEGINS WITH REPUBLIC RUBBER HOSE

● In the Louisiana lowlands, building sand and gravel are brought up from river bottom depositories through Republic Rubber Hose . . . tough, flexible suction hose that withstands the unrelenting glare of semi-tropical suns, and the continual cutting/scraping action of razor-sharp material moving uninterruptedly through smooth, abrasion-resistant tubes.

Republic Rubber Sand Suction Hose is internally reinforced by a specially concealed spiral of steel wire which provides for maximum flexing ease and prevents sudden hose collapse.

It's built so tough that, on a dredge like that pictured above, one length of Republic Hose will outlast several lengths of the pipe it's connected to!

Republic Rubber Sand Suction Hose is supplied in all standard sizes, with or without expanded ends, and, like all Republic Rubber Products made for the construction industry, it's available to you quickly and economically through your local Republic Distributor.

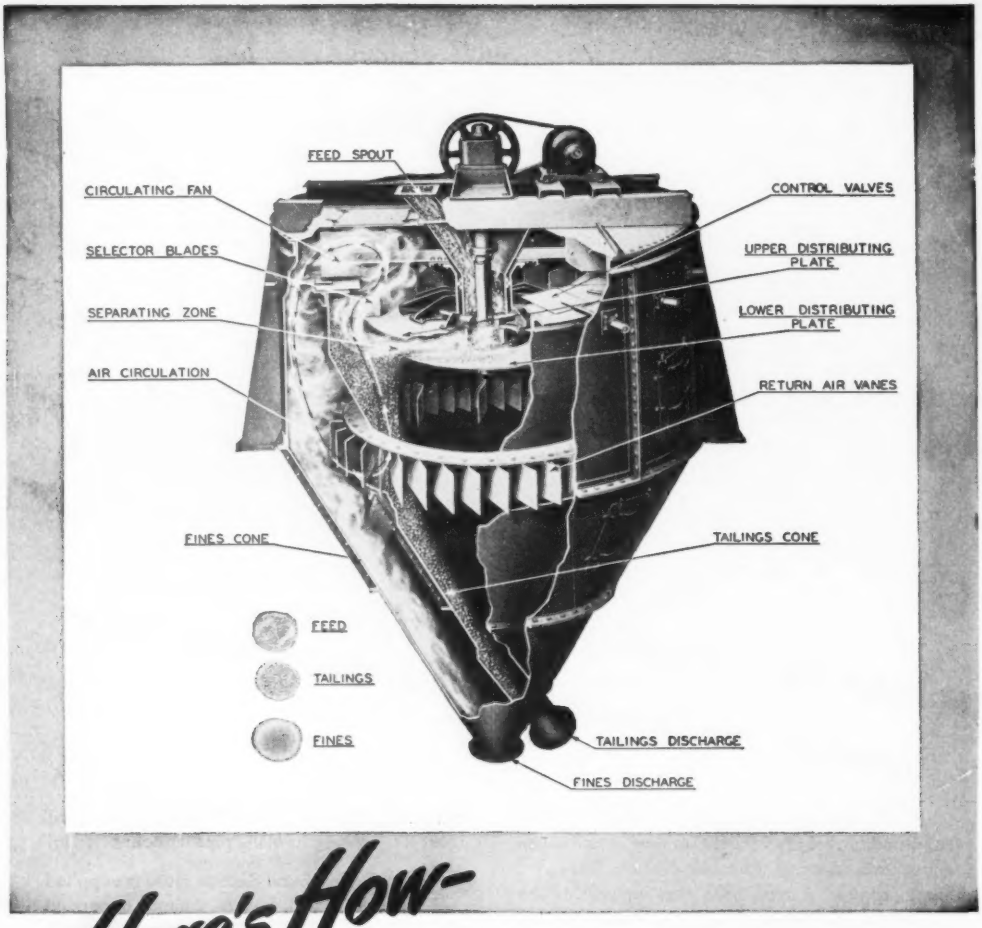
Your Republic Distributor is an expert in industrial rubber applications . . . a man who can help you **start** a job faster with the kind of hose and belting that'll get you **finished** faster and **more profitably!** Contact him today or write direct for full facts.

INDUSTRIAL RUBBER PRODUCTS BY

REPUBLIC RUBBER DIVISION

Lee Rubber & Tire Corporation

YOUNGSTOWN, OHIO



Here's How—

STURTEVANT AIR SEPARATORS

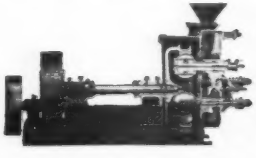
Produce accurate fines with increased output up to 300%

Exact regulation and control of centrifugal forces and air currents, one counteracting and overbalancing the other so precisely that by simple adjustments a product of almost any desired fineness is selected and collected, while coarser sizes are rejected . . . that's the principle of operation of Sturtevant Air Separators.

The benefits you derive from this separator are—increased output by as much as 25% to 300% . . . lower power costs by 10% to 50% . . . reduced maintenance.

A typical on-the-job example is as follows—a 16 ft. separator takes a feed of 750 tons per hour containing only a small percentage of the desired product and delivers 30 tons of material 90%, minus 200 mesh.

Investigate Sturtevant Air Separators today. Write for information and bulletin.



RING ROLL MILL

Capacities from 12 to 18 tons per hour. Range 10 to 200 mesh. Use this mill in closed circuit with Sturtevant Air Separators.

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Designers and Manufacturers of
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
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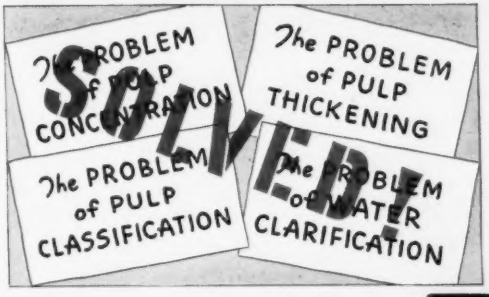

The PROBLEM of PULP CONCENTRATION
The PROBLEM of PULP THICKENING
The PROBLEM of PULP CLASSIFICATION
The PROBLEM of WATER CLARIFICATION
SOLVED!

MILLING and ORE DRESSING MEN Can *Change* WASTE to PROFIT with H+P

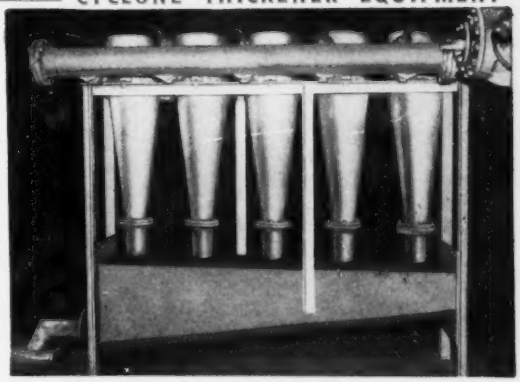
CYCLONE THICKENER EQUIPMENT

Cyclone Thickener equipment is turning waste into profit at a large eastern flotation mill, where agricultural lime is now being recovered efficiently and quickly from zinc and lead flotation tails.

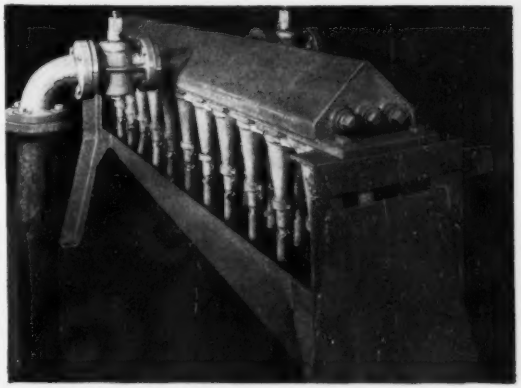
This particular installation consists of eight 14" Cyclones. The Cyclones receive the feed material as a suspension of solids having a specific gravity of 2.50. By rejecting the ultra-fines, which are objectionable, and delivering a concentrated underflow or spigot product, the Thickeners recover approximately 2200 tons of agricultural lime per day. The classification desired and obtained in this operation is 30 microns.

Cyclone Thickeners, which generate forces up to 12,000 times gravity, provide an economical and practical method of controlling solids in Circulating Systems and separating solids from liquids. The Cyclone Thickener's low cost . . . small space requirements . . . minimum upkeep . . . and lack of moving parts makes it the ideal answer to Thickening and Classifying problems.

Heyl & Patterson laboratory and field tests have provided a sound basis for predicting accurately the Cyclone performance on most feeds. For more information send for booklet 5-CT-51 or send us your problem and we will tell you how a Cyclone application can provide the answer.



A typical installation of five 14" Cyclones. Eight of these 14" Cyclones are now being used to recover agricultural lime from zinc and lead flotation tails.



The standard 3" Cyclone Manifold consisting of feed valve, combination feed chamber and overflow chamber, overflow valve, underflow pan and twenty-two Cyclones. The standard 3" Manifold consisting of twenty-two Cyclones has a capacity of 250 G.P.M. and is designed to operate at 40 PSI.

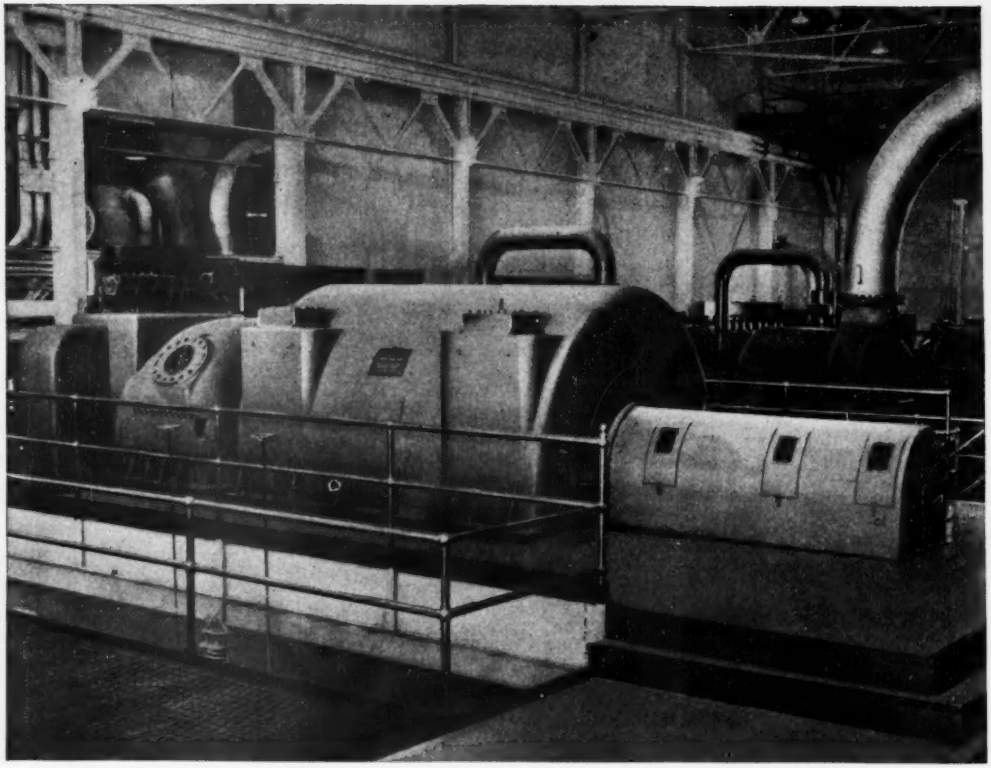
Heyl+Patterson, Inc.

"SINCE 1887"

55 WATER STREET · PITTSBURGH 22, PA.

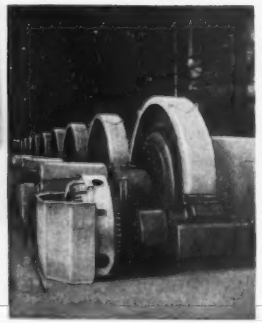
HEAVY BULK MATERIALS HANDLING EQUIPMENT

ALL THE WAY FROM DESIGN TO ERECTION

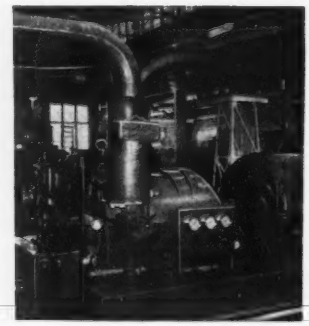


1 **NEW G-E STEAM TURBINE-GENERATOR** generates high-voltage power for this copper company's concentrating and smelting plant. Rated at 10,000 kw, 3600 rpm, the single-stage unit replaces an older 6000-kw unit which generated at 480 volts. Like every G-E turbine-generator, it is custom-built from standard components to meet specific operating conditions.

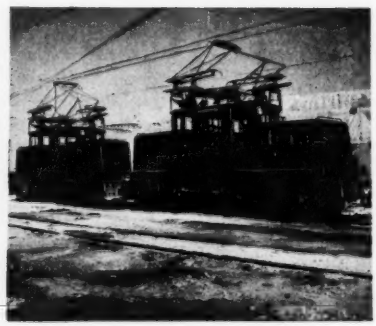
Power system modernized for



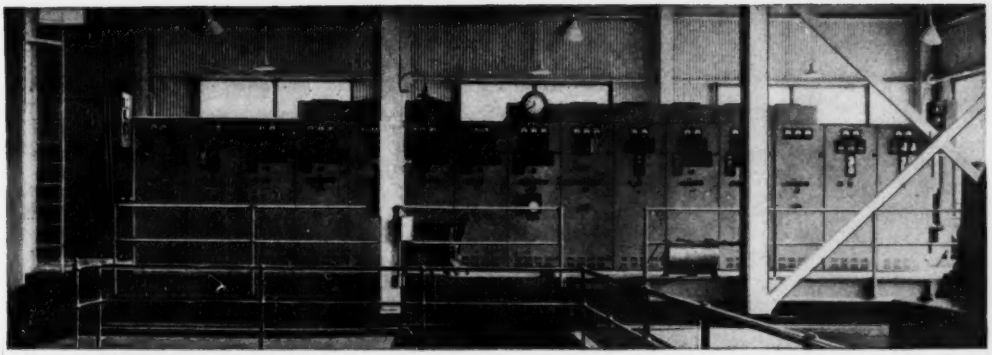
POWER-FACTOR IMPROVEMENT is provided by 28 200-hp synchronous motors driving plant's ball mills.



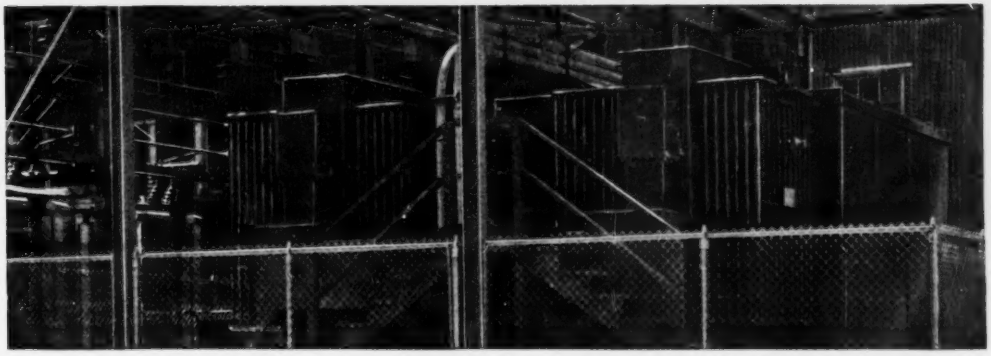
MECHANICAL POWER to drive two turboblowers is generated from process steam by 1915-hp G-E mechanical-drive turbines.



LOW-COST HAULAGE from the copper plant's open pit mine 15 miles away is provided by these two G-E 750-volt 85-ton electric locomotives.



2 **NEW G-E METAL-CLAD SWITCHGEAR** distributes high-voltage power to load-center substations in electrical load areas. These co-ordinated units are shipped completely assembled and ready for installation. Their compact design saves floor space.



3 **NEW G-E LOAD-CENTER SUBSTATIONS,** completely metal-enclosed, step down power from primary voltage to 480-v for use in the ball mill area. High voltage power distribution to load centers reduces voltage drop and cuts power losses.

more efficient distribution

Copper plant increases capacity by adding G-E turbine, switchgear and load-center substations to existing power system

As part of a continuing modernization program at its concentrating and smelting plant, a large copper company in the Southwest recently installed new General Electric high-voltage power generation and distribution equipment. With these new facilities, power is generated and distributed the modern, high-voltage way. Result: increased protection against shutdowns, lower power-distribution cost.

You, too, can benefit from the kind of G-E application engineering that went into this installation. Call your nearest G-E office and ask for a mining specialist. *General Electric Company, Schenectady 5, New York.* 660-25

Engineered electric systems for the copper industry

GENERAL ELECTRIC

Raybestos-Manhattan engineers have developed conveyor belts that are clearly ahead of the field in fastener-holding strength, troughability, flexibility, and tear-resistance . . . belts specially cushioned for heavy duty shock loading. Heavier construction for long lifts, high tensions, grueling loads . . . lighter constructions for factory materials handling, package conveyors and food belts . . . are all in a day's work at Raybestos-Manhattan • Conveyor Belts may not be your problem today, but whenever you think of transmission, conveyor, V-belts or hose . . . or *any* industrial rubber product — remember "Raybestos-Manhattan makes it". Consult your R/M representative.

R/M

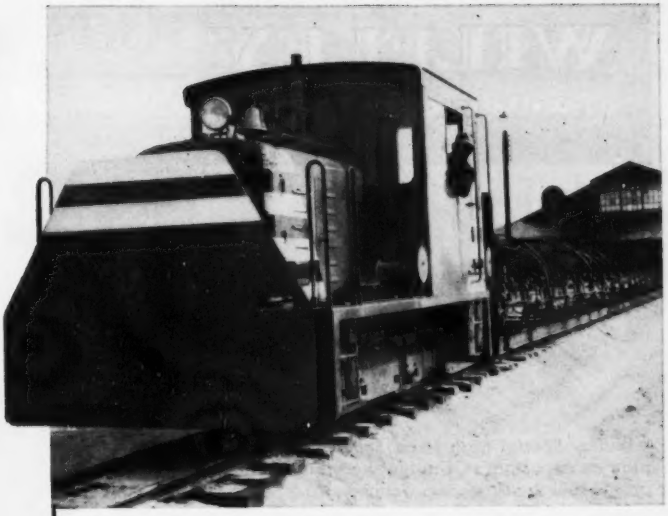
MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks Clutch Facings • Asbestos Textiles • Sintered Metal Parts • Bowling Balls

a $290 fuel saving each month

since they switched to Baldwin diesels



More efficient operation . . . lower costs . . . are normal wherever Baldwin diesels are used. For instance, here's the experience record of the W. J. Smith Wood Preserving Co., Denison, Texas:

"This job was previously handled by a narrow-gauge, steam locomotive which could not, however, push the 94,000 lb. charges up a 4.3% grade as is now done with the diesel.

"Being able to do this, and also charge our treating cylinders with the locomotive, has resulted in a *net reduction of six men in this operation. The monthly savings effected in fuel cost is approximately $290 monthly.*"

SAVINGS! • 6 MEN • $290 IN FUEL EACH MONTH

These savings represent a substantial reduction in operating costs. And they are typical of the results frequently realized by Baldwin users. In addition, there are many other Baldwin advantages . . . the extra power and cleanliness . . . the lower track maintenance . . . the greater availability.

If you feel your track haulage costs are too high, we will be glad to analyze them for you. Why not write today . . . *there is no obligation!*

"Take a letter to Baldwin-Lima-Hamilton Corporation"

- Diesel-hydraulic Locomotives from 12 to 35 tons
- Diesel-electric Locomotives from 25 to 95 tons
- Diesel-mechanical Locomotives in 5 and 8 tons

BALDWIN LIMA-HAMILTON BLH

BALDWIN-LIMA-HAMILTON CORPORATION
Philadelphia 42, Pa.
Offices in Principal Cities

BALDWIN - LIMA - HAMILTON

WILFLEY
centrifugal PUMPS

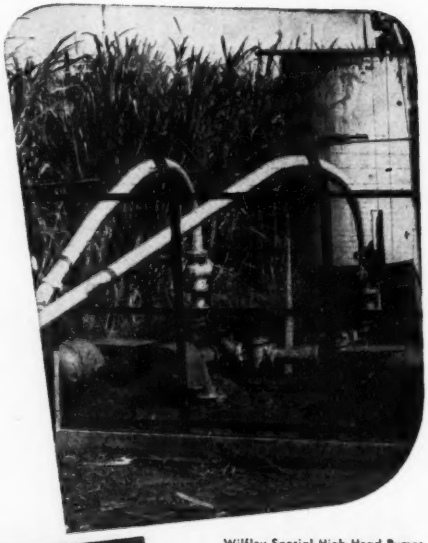
30 acres 2 miles

• ***Wilfley Special High Head Sand Pumps*** play an important role in the successful reclamation program of the Hawaiian Commercial & Sugar Co.

• Each year, at the Puunene Mill, 30 to 40 acres of useless, sandy waste land are transformed into productive ground for sugar cane cultivation.

• Soil, removed from mechanically harvested cane by washers, is settled to a sludge of 15% to 25% solids. This sludge, together with a sludge of repulped filter cake, is pumped to the diked waste area. When dry, there remains a 2 to 3-ft. layer of reclaimed cultivable topsoil over the coral sands.

• WILFLEY Pumps, operating on a 24 hour-a-day, trouble-free schedule perform the tremendous task of delivering 300- 500 G.P.M. of cane washer wastes through 2 miles of 6" pipeline to the reclamation area. As a result, wastes which formerly presented a costly disposal problem, are now converted into revenue-producing land.



Wilfley Special High Head Pumps in operation at the Puunene Mill of the Hawaiian Commercial & Sugar Co

Buy rugged, heavy-duty Wilfley Pumps whenever the job calls for the efficient and economical handling of sludges, slimes, slurries or sands. The new WILFLEY Model "K" Centrifugal Sand Pump, embodying many important mechanical improvements, delivers higher efficiencies, stepped-up production, worthwhile power savings and lower operating costs. Easy interchangeability of wear parts. Low maintenance costs. Every application individually engineered. Write or wire for complete details.

A. R. Wilfley & Sons, Inc.
Denver, Colorado, U.S.A.
New York Office: 1775 Broadway, New York City

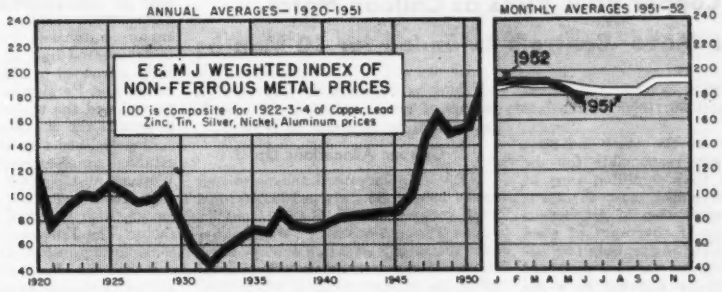
Buy WILFLEY for cost saving performance.

Companion to the famous WILFLEY Acid Pump

Upper: Reclaimed land under cultivation
Center: Diked reclamation area
Bottom: Waste land to be reclaimed

E&MJ OUTLOOK

PRICES



MARKETS

***E&MJ's* price index** sagged again, from 186.88 in May to 179.18 in June. Lower lead, zinc, and silver price averages were the reason.

Off went the 27½¢ ceiling price on foreign copper sold to domestic consumers. Producers outside the USA can get anything the buyer is willing to pay for copper, but domestic producers are held to a 24½¢ ceiling. Mounting costs and increasing demands by labor might well blow this inequitable situation wide open.

According to law, when *E&MJ's* monthly average price for zinc goes below 18¢, the Tariff Commission notifies the President, and he is required to reimpose the duty of 0.7¢ per lb. on metal, and 0.6¢ per lb. on metal in ore. The June zinc average is 15.740¢.

•

LABOR

CIO's stubborn fight with Steel over the union shop may end in a face-saving compromise under which new workers will be required to join the union and authorize dues deductions, but may elect to drop out of the union within 30 days. Pittsburgh Steel, fourteenth largest basic steel producer, broke the ice by signing a contract with such provisions.

Congress clipped Wage Stabilization Board's wings in the new Defense bill by specifying "The Board shall have no jurisdiction in any labor dispute, or with respect to any issue involved therein."

•

AT HOME

Critical flotation tests now under way in eastern and western mills may mean shuffling of machine orders running into the millions.

Memo to mining educators: Millmen scouting for new technical help are giving preference to chemical engineers. How heavy is your ore-dressing curriculum in chemistry?

***E&MJ Outlook* prediction last September:** "A new nickel strike in Minnesota looks promising." June 1952 follow up: International Nickel Co. plans to drill in a 5,000-acre low-grade nickel-copper property 12 mi. south of Ely, Minn.

A permanent DMPA? Paley Report says yes. See p. 110.

•

ABROAD

Foreign manufacturers are cutting heavily into American export markets in South America, Europe, and Africa. Reasons: (1) Europe's output, chiefly German, is expanding fast. (2) Europe is aggressively recapturing markets lost to U.S. during the war. (3) Foreign exporters go out of their way to master local languages and comply to the letter with import regulations. (4) Americans generally don't.

Saudi Arabian money managers are now toying with the idea of replacing gold and silver with paper money. If this happens, one of the world's last important outposts for hard money will have toppled.

MARKETS—Trends and Prices

Foreign Copper Price Rises as Chilean Metal Begins to Move—Controls Extended for 10 Months

WAGE AND PRICE CONTROLS were extended to April 30, 1953 on the last day of June.

The strike in the steel industry, which has been responsible for the loss of more than 9-million tons of steel as June ended, now threatens to curtail consumption of nonferrous metals because of shortages of steel in key industries. So far, only two important nonferrous metals—zinc and tin—have actually suffered as a result of the steel strike. Iron ore is backing up at the mines.

Most observers still look for an early settlement of the steel dispute. However, it is certain to end in higher costs and prices. The higher costs will spread to all divisions of the nonferrous metals industry. The trend toward easier credit terms and the availability of so-called tight materials for civilian consumption points to a strong drive by the government to bolster business and influence the fall elections.

Owing to work stoppages, the general rate of industrial activity has continued to fall. The Federal Reserve Board's index of production for May was estimated at 214% of the 1935-39 average. This compares with 216 in April and 222 in May a year ago. Though the rate is expected to decline again in June, some improvement in production is almost certain to occur later in the year.

Price Movements Erratic

Lower monthly averages for lead, zinc and silver caused the *E&MJ* index of nonferrous metal prices to decline from 186.88 in May to 179.18 in June. Domestic copper, a component of our index, was unchanged Foreign copper, which advanced on the strength of the Chilean agreement, would have checked the decline if our index reflected the world price.

The National Production Authority went ahead with its plan to allocate domestic refined copper to consumers and grant an "entitlement" for the amount of foreign copper that the brass and wire mills, along with other consumers may purchase. OPS announced that wire and brass mills will be allowed to add 3.84¢ a lb. on the copper content of their product to compensate for the rise in price of foreign metal. Custom smelters were permitted to market foreign-origin copper free from price control.

Under the plan, which became effective July 1, NPA will allocate 60% domestic copper to consumers and issue "entitlements" to purchase 40% foreign copper. However, consumers will not be required to buy foreign copper. Unused entitlement certificates must be returned to NPA.

Copper Allocations Up

NPA has increased the permitted use of copper for July to 133,300 tons. This compares with 104,900 tons in June. The optimism in Washington over the supply situation springs from the belief that consumers will take on all of the foreign metal to which they are entitled under the new pricing arrangement. In market circles, however, few share this optimism. Some consumers have stated that they do not intend to purchase foreign copper freely at the prices now prevailing on the Chilean product; in fact, they were able to obtain fair tonnages at concessions from other foreign sources. It has not been so easy to sell copper products in recent months as it was a year ago. Increased competition has been coming into the market.

Interest naturally centered in the foreign price situation. So-called premium prices have virtually disappeared. Sales of Chilean copper at 35½¢, f.a.s. Chilean ports, increased in volume after a slow start. Canadian and African producers, however, took on business at prices varying between 33¢ and 35¢, and Belgian Congo metal was offered in the European market on the basis of 32.80¢ per lb. Substantial tonnages were involved in sales reported to *E&MJ* throughout the month, and our quotations on foreign copper were established on a broader base than for some time past. The average for June in foreign copper was 34.586¢., f.o.b. refinery equivalent, against 27.908¢ in May.

Disappointment over OPS's stand on the domestic market for copper continues. Upward pressure on the 24½¢ price is increasing and market experts see no good reason for maintaining an abnormal two-price system under prevailing conditions. The spread between Chilean copper and the domestic product of 12¢ (delivered) is too great. It is argued that either the foreign price comes down or the domestic market rises to achieve a better balance. Problems in pricing copper products have become too complex.

Lead Duty Restored

President Truman signed the order that restored the import duty on lead on June 25, and the rate of 1 1/16¢ per lb. on metal and ¾¢ on metal contained in ore and concentrates became effective on the following day. Threatened with purchases of 30,000 tons by the government for its reserve, which steadied the market, consumers purchased lead rather freely in the second half of the month. The price advanced to 16¢, up 1¢ from the recent low. Foreign purchases also improved and the undertone was steady to firm as the month ended.

Zinc declined 4½¢ during the month, establishing the quotation for Prime Western at 15¢, East St. Louis. Business remained dull throughout the month, with the steel strike a market factor. The June average for zinc fell considerably below 18¢, with the result that the import duty on the metal will be reimposed as soon as President Truman gets around to it. Inventory controls on zinc ended June 27.

Average Prices for June (E&MJ Quotations)

Copper:

Electrolytic, domestic, refinery	24.200
Electrolytic, export, refinery ..	34.586

Lead:

Common, New York	15.257
Common, St. Louis	15.051

Silver and Sterling Exchange:

Silver, New York, per oz.	82.750
Silver, London, pence per oz. ..	72.500
Sterling Exchange, "Checks"	278.604

Zinc:

Prime Western, East St. Louis	15.740

Tin:

New York Straits	121.500
New York, 99% min. ....(e)	120.500
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$195.240
Antimony (E&MJ) (d)	42.470
Antimony, bulk, Laredo	39.000
Antimony, in cases, Laredo .	39.500
Platinum, refined, per oz. ..	$90.000
Cadmium (a)	225.000
Cadmium (b)	232.500
Cadmium (c)	240.000
Aluminum, 99% plus, ingot	19.000
Magnesium, ingot	24.500
Nickel (f)	56.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lbs.

(a) Cadmium average based on the producers' quotation.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.

(e) Tin content.

(f) F.o.b. Port Colborne, U.S. duty included.

Quicksilver was unsettled on increased offerings from various sources, and a reduction in the Spanish price late in the month to the equivalent of $165 per flask, f.o.b. port of shipment.

Tungsten ore was unchanged domestically but unsettled abroad. Foreign ore was available at prices ranging from $54 to $56 per short ton unit, f.o.b. port of shipment.

Manganese ore was inactive, but quotations on nearby material were about unchanged. On contract business prices were unsettled.

(Markets continued on page 112)

"Free" Gold Market

The volume of business in the free gold markets of the world reached approximately $130-million in June, a new monthly high. Prices were lower in most markets. Sales in Bombay were heavy, on the decline in prices of cotton and other commodities. Quotations in the free market, according to Pick's World Currency Report, were as follows:

	COINS		BARS (12.5 kg.)	
	May 31	June 30	May 31	June 30
NEW YORK, transit	.....	.....	$37.75	$37.40
MANILA	$48.50	$48.25	39.60	39.50
HONG KONG	48.00	47.50	40.35	40.00
BOMBAY	51.25	49.50	47.50	43.50
TANGIER	50.75	50.90	37.75	37.40
BEYROUTH	51.50	50.25	37.85	37.45
PARIS	53.50	53.00	39 40	39.00
BUENOS AIRES	48.50	47.50	40.75	40.00

Major Metals

U. S. DAILY AND AVERAGE PRICES

June 1952	Electrolytic Copper (a) Domestic	Electrolytic Copper (b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
2	24.200	30.325	121.500	15.000	14.800	17.500
3	24.200	36.875	121.500	15.000	14.800	17.500
4	24.200	31.925	121.500	15.000	14.800	17.500
5	24.200	36.075	121.500	15.000	14.800	16.000
6	24.200	35.975	121.500	15.000	14.800	16.000
7	No Market	35.975	121.500	15.000	14.800	16.000
9	24.200	35.950	121.500	15.000	14.800	16.000
10	24.200	36.075	121.500	15.000	14.800	16.000
11	24.200	34.500	121.500	15.000	14.800	16.000
12	24.200	33.900	121.500	15.000	14.800	16.000
13	24.200	33.500	121.500	15.000	14.800	16.000
14	No Market	33.025	121.500	15.000	14.800	16.000
16	24.200	33.400	121.500	15.000	14.800	16.000
17	24.200	33.325	121.500	15.000	14.800	16.000
18	24.200	33.575	121.500	15.000	14.800	15.000
19	24.200	35.500	121.500	15.000	14.800	15.000
20	24.200	35.150	121.500	15.000	14.800	15.000
21	No Market	33.335	121.500	15.000	14.800	15.000
23	24.200	35.455	121.500	15.425	15.075	15.000
24	24.200	35.870	121.500	16.000	15.800	15.000
25	24.200	35.700	121.500	16.000	15.800	15.000
26	24.200	34.625	121.500	16.000	15.800	15.000
27	24.200	35.400	121.500	16.000	15.800	15.000
28	No Market	34.300	121.500	16.000	15.800	15.000
30	24.200	34.925	121.500	16.000	15.800	15.000
AVERAGES FOR MONTH						
June	24.200	34.586	121.500	15.257	15.051	15.740
AVERAGES FOR WEEK						
June 4	24.200	32.408	121.500	15.000	14.800	18.300
11	24.200	35.758	121.500	15.000	14.800	16.000
18	24.200	33.454	121.500	15.000	14.800	15.833
25	24.200	35.168	121.500	15.404	15.179	15.000
CALENDAR WEEK AVERAGES						
June 7	24.200	34.525	121.500	15.000	14.800	16.750
14	24.200	34.492	121.500	15.000	14.800	16.000
21	24.200	34.048	121.500	15.000	14.800	15.333
28	24.200	35.225	121.500	15.904	15.679	15.000

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

June 1952	Sterling Exchange "Checks	Silver (c) New York	Silver (c) London	Gold London	Gold (d) United States
2	278.9375	82.750	Holiday	Holiday	$35.00
3	278.9375	82.750	72.500d.	248s.	35.00
4	278.9375	82.750	72.500d.	248s.	35.00
5	278.8125	82.750	72.500d.	248s.	35.00
6	278.8750	82.750	72.500d.	248s.	35.00
7	(e)	(e)	(e)	(e)	35.00
9	278.9375	82.750	72.500d.	248s.	35.00
10	278.9375	82.750	72.500d.	248s.	35.00
11	278.6250	82.750	72.500d.	248s.	35.00
12	278.5000	82.750	72.500d.	248s.	35.00
13	278.5000	82.750	72.500d.	248s.	35.00
14	(e)	(e)	(e)	(e)	35.00
16	278.5000	82.750	72.500d.	248s.	35.00
17	278.5000	82.750	72.500d.	248s.	35.00
18	278.5000	82.750	72.500d.	248s.	35.00
19	278.3750	82.750	72.500d.	248s.	35.00
20	278.3750	82.750	72.500d.	248s.	35.00
21	(e)	(e)	(e)	(e)	35.00
23	278.3750	82.750	72.500d.	248s.	35.00
24	278.3750	82.750	72.500d.	248s.	35.00
25	278.3750	82.750	72.500d.	248s.	35.00
26	278.3750	82.750	72.500d.	248s.	35.00
27	278.5000	82.750	72.500d.	248s.	35.00
28	(e)	(e)	(e)	(e)	35.00
30	278.4375	82.750	72.500d.	248s.	35.00
AVERAGES FOR MONTH					
June	278.604	82.750	72.500	—	35.00
AVERAGES FOR WEEK					
June 4	278.891	82.750	—	—	—
11	278.838	82.750	—	—	—
18	278.500	82.750	—	—	—
25	278.375	82.750	—	—	—

Calendar week averages, New York silver: June 7th, 82.750; 14th, 82.750; 21st, 82.750; 28th, 82.750.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver is pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Lutjen

That's not a bushel of walnuts on the cover; those little round things are taconite pellets you've been hearing so much about. With batting and infield practice over, the taconite game is about to get under way. On page 72, we supply you with an up to date summary so that you can follow developments as taconite projects leave the laboratory and pilot-plant stages, and head for production on a commercial scale. This straightforward report tells you who has done what and gives credit where credit is due as far as taconite progress is concerned.

We're also concerned with iron on page 84. "Itabira Is Breaking Its Bottlenecks" may sound more like an action report on a wild party, but you'll find worth-while reading in the story of how a new iron ore project is overcoming a lot of obstacles.

We haven't done any serious envying since Ali Khan and Rita Hayworth came to the parting of the ways, but we're about to be in business again. Last month we received a change-of-address announcement from Jack Myers, well known former resident of Copperhill, Tenn. Mr. Myers, we are informed, from now on can be reached at 124 Putnam Park, Greenwich, Conn., from May 15 to October 15. And from October 15 to May 15, the address will be Bahia-Mar, Fort Lauderdale, Fla. As they say in the Deep South, "Man! That's really living."

With taxes becoming even more certain than death, our citizenry appears to be waxing wrother than ever. It seemed that practically every other piece of prose that came across the desk last month took a roundhouse swing at the great American institution of taxation. Our favorite entry in the anti-tax campaign was written by an anonymous, latter-day Abe Lincoln in *The Massachusetts Savings Banker.*

"One score and 17 years ago, our Congress brought forth upon this nation a new tax, conceived in desperation and dedicated to the proposition that all men are fair game.

"Now we are engaged in a great mass of calculations testing whether that taxpayer or any taxpayer so confused and so impoverished can long endure. We have met on form 1040. We have come to dedicate a large portion of our income to a final resting place with those men who here spend their lives that they may spend our money.

"It is altogether anguish and torture that we should do this. But in a legal sense, we cannot evade, we cannot cheat, we cannot underestimate this tax. The collectors, clever and sly, who computed here, have gone beyond our power to add and subtract.

"Our creditors will little note nor long remember what we pay here, but the Bureau of Internal Revenue will never forget what we report here. It is rather for us to be dedicated to the great task remaining before us—that from these vanished dollars we take increased devotion to the few remaining, that we here highly resolve that next year will not find us in a higher income tax bracket."

You may recall that last month we offered some fabulous prizes for anyone who could explain why the doorway in a Navajo hogan always faces east. No serious run on our supply of war surplus bicycle clips has resulted from this munificent gesture, but we did get several replies—none of them very helpful, however. One fellow had what seemed like a reasonable answer, but it cast such infamous reflections on the Bureau of Indian Affairs, that frankly, we didn't have the nerve to print it. Another cryptic note stated, "Send bicycle clips!! It's a foregone conclusion that they look to the east to see what in hell's coming out of Washington next."

Let's forget the whole thing.

There was a real action story in the news from Johannesburg this month, but unfortunately it got pushed out of the news columns by a couple of boreholes that intersected an astonishing number of in.-dw. of some kind of rock or other. However, we feel that a deed of heroism should not go unhonored and unsung, so here it is; dateline, Johannesburg:

"At one stage during shaft-sinking at Freddies South No. 2 shaft, which was recently completed, the shaft was saved by quick action of two of the mines senior officials.

"They were called out at 11 pm one night when a serious inrush of water threatened the shaft, and promptly dived fully clothed into 15 ft. of water to close the valve through which the water was pouring."

Of course this typically Anglo-Saxon understatement of stark drama requires some reading between the lines. We prefer to think of the two heroes in evening dress, in full keeping with the traditions of the Empire. Perhaps they were engaged in a crucial rubber of a local bridge tournament. Suddenly the jangling of the telephone shatters the tense playing of a six no-trump bid (doubled and vulnerable.) The shaft is being flooded! Time for only a brief but brave, grim farewell from wives and sweethearts (or both) and then that mad dash by zebra across the wild countryside to the mine. One glance gives the intrepid officials the picture, and without hesitating long enough to discard even so much as a waistcoat, they plunge into the rising waters. On the brink of the shaft the less heroic anxiously peer down, counting the bubbles as the seconds lengthen into minutes. Suddenly a mighty cheer breaks out! The water stops rising! The shaft is saved! Somewhere a band begins playing "There'll Always Be a South Africa."

This may not be the way it happened, but in Hollywood, who cares! We'll get Groucho Marx and Buster Keaton in the starring roles, write in a part for Ava Gardner, shoot the thing in technicolor, and then just sit back and rake in the chips.

ENGINEERING AND MINING JOURNAL
JULY, 1952

Copper Needs Your Help

THE AVERAGE AMERICAN'S sense of fair play and his feeling of outrage at being treated unfairly are not as strong as his respect for the duly constituted agencies of his government. Either that, or one must conclude that the U. S. copper industry, including its consumers, just isn't average.

For there has never been a time as far as we know when the government's treatment of the copper industry was so outrageously unfair and as completely nonsensical as it has been in recent weeks. Yet the industry carries on, albeit under protest, striving to make an impossible situation work.

How did this situation come about? Basically, by a confusion of politics and misguided zeal in planning. Briefly, here is what happened:

Rearmament programs, stockpiling, and booming civilian industries in the U.S. have chewed up copper at a terrific rate ever since the Korean war began. Demand for copper here sent U. S. buyers all over the world looking for more. This, in turn, scared other industrial nations into buying up all the copper they could lay hands on, and the result was a copper shortage. It was a world-wide shortage, and many people mistakenly thought it was permanent.

Prices might have shot sky-high, temporarily at least, but price control in the U.S. and good sense on the part of most of the world's producers held prices down.

Chile discovered, however, that she could sell copper in the premium markets of Europe at famine prices. However, her copper was going to the U.S. at 24½c. She arranged to set aside 20% of the American-owned companies' copper to be "fabricated locally," which meant actually that it would end up abroad. Then, as consideration for continuing to ship 80% to the U.S., she got an additional 3c per lb. promised her by the State Department. The companies which mined, smelted, and sold the copper weren't consulted. They were simply told: "Chile is to get 27½c for her copper. You figure out how."

With the U.S. ceiling price at 24½c, this took a bit of doing. Sales offices had to be set up in Chile. The OPS had to approve the arrangements and to grant price relief here and there. It was difficult, but it was done.

The "permanent" copper shortage began to come to an end. Chile's premium markets dried up early this year and her income, based almost wholly on copper and nitrates, fell off badly. Chile called for help again.

Chile said she thought a price for all her copper of about 33½c per lb. ought to do it. The State Department finally got the defense mobilizers to agree to it, and the order was issued. Consumers in the U.S. could pay any price they wished for Chilean copper. Chile promptly complicated things by refusing to okay any sales under 35½c per lb., not 33½c as she had indicated previously.

As this was being written, Washington was trying to encourage people to buy Chilean copper at 35½c without letting them pay more than 24½c for U.S. copper. This impossible spread was to be distributed "equitably" among consumers on a 60-domestic 40-foreign basis.

Washington came up with one expedient after another, all of them dodging the obvious fact that nothing but the re-establishment of a free market in copper could really solve the problem.

Consider, therefore, what is fair about making consumers of copper pay the cost of this country's efforts to support another nation's inflated economy?

What's fair about holding U.S. copper miners down to 24½c and all but forcing U.S. consumers to buy Chilean copper at 35½c?

What's fair about taking a domestic producer's copper away from his fabricating subsidiary at 24½c and expecting him to replace it with foreign copper at 35½?

Nothing, of course. None of this foolishness has any relationship to those ideals of fair play America is supposed to represent.

If we, as a nation, want to support Chile's economy, let's do it as a nation, forthrightly, and not at the expense of our producers and consumers of copper alone.

We are frankly amazed at the patience of the domestic industry. Here, as we've outlined it, is as bald a piece of injustice in government as we know of. True, a fight is being made, but there ought to be word from individuals like yourself to back it up. Write to your senators, and congressmen now. Ask them to demand either decontrol of copper or one ceiling price for both domestic and foreign metal. Help stop this nonsense.

Table 1. TACONITE (and related) PROJECTS

	Tons Conc. Per Year	Tons Crude Per Day	Investment	Ready	Percent Ownership	
MINNESOTA						
ERIE MINING CO.						
Aurora pilot plant	200,000		$2,000,000	June 1948	Bethlehem	45
Commercial plant					Youngstown	45
First half	5,000,000	40,166		1957	Interlake	7
Ultimate	10,500,000	88,000	$298,000,000	?	Pickands, Mather	3
RESERVE MINING CO.						
Babbitt experimental section	300,000		7,500,000	1952, fall	Republic	50
Beaver Bay, 8 sections	2,500,000	20,000	75,000,000	1955	Armco	50
12 sections	3,750,000	30,000	160,000,000	1957		
Beaver Bay, ultimate	10,000,000	83,000	?	?		
OLIVER IRON MINING DIV. (U. S. Steel)						
Concentrator, pilot	500,000	4,000–6,000	$17–20,000,000	1952, late	U. S. Steel	100
Experimental agglomeration plant	1,000,000			1951–52		
MICHIGAN						
HUMBOLDT MINING CO.						
One unit	200,000	1,100	$10,000,000	1953	Cleveland-Cliffs	50
Two units	400,000	2,200		1955	Ford Motor Co.	50
HANNA, GROVELAND						
Pilot plant		10 t.p.h. 33% iron 45% silica	?	?	M. A. Hanna	100

Work on Taconite Now Heads Toward Commercial Goal

1952 should see two more preliminary or experimental plants in operation, with construction of two "ultimate" plants begun. The annual production should be at least 10,000,000 tons in 1960.

A. H. HUBBELL
Managing Editor

AT MID-YEAR 1952 the goal of utilizing the taconite reserves of the Mesabi Range in Minnesota as a source of iron ore for the steel industry is appreciably nearer than it was four years ago. Then the Erie Mining Co. had just started its 200,000-ton pilot concentrating and pelletizing plant, at Aurora, after several years of work at its big laboratory and test plant in Hibbing. Reserve Mining Co., with its enormous holdings of magnetic taconite, obtained from the Mesabi Iron Co. and equivalent to half a billion tons of concentrates, was seeking the financing necessary for a project of adequate size. Oliver Iron Mining Co. had just provided itself with a large and splendidly equipped research laboratory in Duluth. Today, all three companies have in hand important projects for beneficiating magnetic taconite.

The present picture is further improved by two undertakings recently initiated in Michigan's Upper Peninsula to beneficiate low-grade ores in which the iron mineral is not magnetic. One is the joint project of Cleveland-Cliffs Iron Co. and Ford Motor Co. for treating the jasper ore of the Humboldt mine. The other is the investigation being made by M. A. Hanna Co. into the feasibility of treating the ore at its Groveland property. Flotation, in contrast to magnetic separation at the three Minnesota plants, features the recovery process considered in each of the two cases.

Capital investment for the Minnesota projects and Humboldt enterprise will total about $640,000,000. Other major facts about these projects are given in Table 1 above.

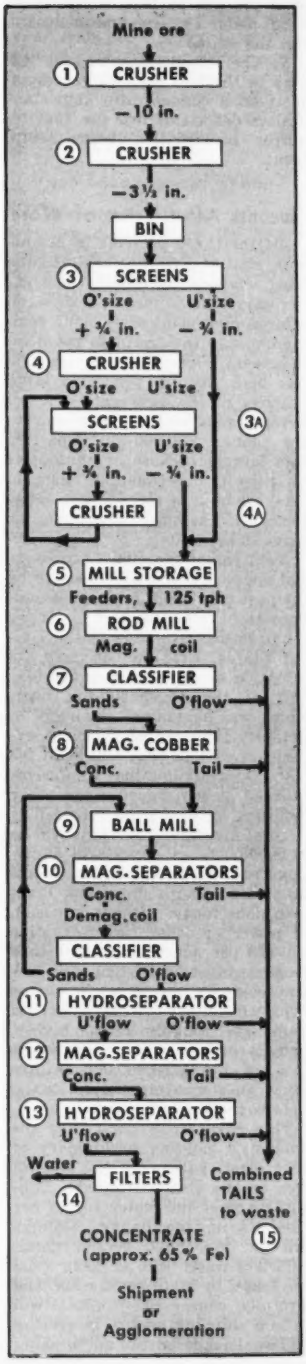
Participation by Steel Makers Is Wide

In the overall picture presented by the tabulation, certain points deserve comment. They are:

1. Wide direct participation by the steel industry in taconite beneficiation. The three largest steel producers, U. S. Steel, Bethlehem and Republic are taking an important part, together with Youngstown and Armco. Interlake Iron Corp. also participates directly, to the extent of its 7% share in the ownership of Erie. Erie, it should be added, is managed by Pickands, Mather & Co. Reserve's affairs from the start have been in the hands of Oglebay, Norton & Co. In

(*Please turn to p. 74*)

Here's one of the many flowsheets worked out for taconite



LEGEND ➡

1. Gyratory, 42 in., set to 10 in. possibly.
2. Gyratory, 30 in., set to 3½ in. possibly. Two for the one 42-in. crusher.
3. Vibrating screens.
4. Symons, at least 5 ft., probably one per 30-in. gyratory.

4A. Symons, as for item 4. Probably 2. MILLING (Assumed 125 tph)

5. Feeders, probably constant-weight type. One per rod mill.
6. Rod mill, probably 10-ft. dia. Grinding fine enough to permit rejection of maximum waste by cobbers following. Magnetizing coil flocculates fines to keep them out of classifier overflow and get them over cobber.
7. Classifier, 2-screw, probably one per rod mill. Reduces water on following conveyor to cobbers.
8. Magnetic cobbers, probably 4. Reject as much waste as possible to reduce ball mill tonnage.
9. Ball mill. Probably two 10-ft. mills for 125 tph, at, say, 100% minus 100 mesh.
10. Magnetic separators, probably 8 to 10, with following classifier are in closed circuit with ball mill. Demagnetizing coil follows because classifier, unlike item 7 preceding, is actually making size separation and must have fines dispersed to get proper overflow.
11. Hydroseparator. Here, it primarily dewaters to get proper density. Will reject a small amount of waste.
12. Cleaner magnetic separators. Probably 8 to 10, and likely to be of drum-type, needed for 100 mesh and finer. Drum-type is higher in capacity and efficiency, makes cleaner product.
13. This hydroseparator receives final magnetic separator concentrate for removal of water.
14. Filter. Probably one 8-ft. dia. by 10-ft. drum unit will be sufficient for a mill section handling 125 tph—or two of smaller capacity, tonnage depending on fineness of grind and other characteristics of material.
15. All water appears to be leaving circuit with tails at this point. On a similar job having 82 tph solids, 190 tph water is required, equivalent to 8500 gpm and 30% solids.

THE SECRECY that is customary during the development of big projects prevails as to the flowsheets of the three taconite plants. It is likely that decision has been made as to general features of design, layout and major equipment. A vast amount of detail undoubtedly remains to be worked out. Any flowsheet of the moment can be regarded as subject to change. Much equipment has to be ordered.

More than one generalized flowsheet for concentrating the magnetic taconite has been published in past years. Usually indicated are: three-stage crushing with screening; grinding in rod and ball mills to a high percent minus 325 mesh; classification and magnetic separation in two or three stages, with final filtering and perhaps agglomeration. In its July, 1949 issue on the theme "Mining Looks to the Future," *E&MJ* presented a generalized flowsheet worked out in the laboratory by the staff of one of the companies. In the present issue we offer another more recent flowsheet with somewhat more detail, merely as an interesting possibility.

Interest is expressed in the Hydroscillator as a possible substitute for the classifier. A place for such substitution in the flowsheet illustrated would be in the closed circuit with ball mill 9. This piece of equipment is said to make a sharp, clean separation.

The cyclone is also under scrutiny as a possible substitute for the classifier in the grinding circuit. Such a change would be a radical innovation. If actually used, it will affect the capacity of the ball mill and will save floor space. On the other hand, wear is a considerable item. Besides the Dorr Co., Heyl & Patterson and Georgia Iron Works are now building cyclones, possibly other manufacturers.

Magnetic separation is said to be less simple than it looks. The problem of recovering the locked mineral particle presents itself. Separators have undergone great development. Far better machines in respect to efficiency and capacity can be had today, it is said, than were available five or six years ago. Permanent magnets are being studied, both for finishing and cobbing, in comparison with electromagnets. Power saved would be small but they are not subject to operating delays such as happen with electromagnets when a short occurs.

Pelletizing, as a means of agglomerating the concentrates, has long been a focus of interest in taconite beneficiation. The assumption is fair that the problems it offered are solved or, at least, less pressing. The furnace at Lebanon, Pa. is said to be successful. That at Ashland has been dismantled. A new procedure, developed by Allis-Chalmers and Arthur G. McKee, is well regarded in some quarters. It involves pelletizing and heat-hardening. "Green" (soft) pellets are predried in a rotating drum and fed to a traveling grate, on which they are further dried, preheated, ignited, and burned. A feature is that waste heat from the grate is used in drying and preheating to cut fuel consumption.

The question of recovering nonmagnetic iron mineral in the magnetic taconite is being studied. Oliver will make provision for such recovery in connection with its new plant—just what has not been stated.

Table 2. Estimated Production of Concentrates Four Projects, 1952-1960

(MILLIONS OF TONS*)

	1952	1953	1954	1955	1956	1957	1958	1959	1960
ERIE									
Pilot	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Large						5.0	5.0	5.0	5.0
RESERVE									
Babbitt	0.15	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Beaver Bay					2.5	2.5	3.75	3.75	3.75
OLIVER		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
HUMBOLDT			0.2	0.2	0.4	0.4	0.4	0.4	0.4
TOTAL	0.35	1.0	1.3	1.3	3.9	8.9	10.15	10.15	10.15

* It is assumed that a plant will first produce at its rated capacity the year following that in which it is scheduled to be completed. The Babbitt preliminary plant, however, will start this year.

Table 3. Steel Capacity of U. S. and Supporting Iron Ore Supply—U. S. Bureau of Mines

(MILLIONS OF GROSS TONS)

	1952	1955	1960
Steel Capacity (Net Tons Jan. 1.)	108.6	122	130
Iron ore requirements			
Domestic consumption	127	145	160
Exports	5	4	4
Total	132	149	164
Iron ore supplies			
Domestic:			
Lake Superior:			
Direct shipping	75.0	68	40
Concentrates:			
Taconite	0.5	2	15
Other	24.5	30	35
Southeastern States:			
Direct shipping	6.5	6	6
Concentrates	2.5	3	4
Northeastern States: (virtually all concentrates)	5.5	6	6
Western States	9.6	11	12
Total Domestic Supply[1]	124.1	126	118
Total Foreign Supply	11.5	23	45
Total Iron Ore Supply[1]	135.6	149	163

[1] Excludes by-product ore obtained from treating pyrites.

Michigan, the Humboldt project will provide Ford's River Rouge steel works with 20% of its needs.

2. World's largest concentrator. Erie's ultimate 10,500,000-ton plant will be the largest concentrator in the world. If converted into tons of crude ore per 24 hours at a 3 to 1 ratio of concentration, this plant will be handling 88,000 tons of crude per 24 hours when running at capacity. This may be contrasted with the more than 95,000 tons of crude copper ore treated daily by Kennecott's Magna and Arthur concentrators combined, at Garfield, Utah, at the peak of World War II.

3. Reserve's plant, of a slightly smaller annual capacity in finished product, will treat 83,000 tons of crude daily at its 3 to 1 concentration ratio; will vie with Erie in this respect.

4. Oliver's agglomeration plant at Virginia stands ready to treat concentrates from the company's taconite plant now being built near Mountain Iron as soon as the latter is completed.

5. Magnetic separation will feature the flowsheets of the three Minnesota plants.

6. The first use of flotation on a commercial scale for beneficiating iron ore will be that at the Humboldt plant. The iron will be floated, not the silica.

7. The Humboldt enterprise will also be the first in Michigan to exploit on a commercially important scale a deposit of iron ore that requires beneficiation before shipment.

Success After Years of Work

Of the three projects in Minnesota, that of Erie has achieved the most advance, especially when experience with actual operation on a large pilot-plant scale using commercial-size equipment is taken into account. Through four years Erie has been making pellets—a large tonnage in the aggregate—though never throughout any one year to the plant's 200,000-ton capacity; this largely because of shutdowns to permit experimental changes. The pellets, it is claimed, are satisfactory in the blast furnace and as cargo in the boats.

Next comes the step to commercial operation. It would seem to be the part of wisdom for a steel company to have a good part of its ore requirements available in the United States. Erie has declared its intention to start building the first half of the 10,500,000-ton plant which was announced originally in October, 1949. After sufficient experience with it, they will build the rest. Open-pit mining equipment, railroad, power, housing and other facilities must also be provided.

Total investment for Erie will be $298,000,000, an impressive figure. Construction and equipment costs have been steadily mounting. Plant cost alone today, without provision of power or other facilities, runs $20-$23 per annual ton of finished product. In general, equipment, except electrical items, costs almost twice what it did in 1939. Electrical items are roughly 125% higher. Erie is to be allowed to amortize 75% of the $298,000,000 in five years, in computing federal taxes. Details remain to be ironed out.

This commercial plant, like the company's existing preliminary or pilot plant, will be in the Aurora area on the Eastern Mesabi. Tailings disposal and water supply are problems on the Range. Tailings will be impounded behind dams. Sufficient water will be taken from two lakes, by state permission, and carefully conserved. Product will go to a shipping port to be created at Two Islands on the north shore

of Lake Superior. A 65-mi. railroad will be required.

Meanwhile the Reserve Mining Co. is striving to get its preliminary section at Babbitt ready for operation in August. It will serve as an experimental section for the ultimate plant. The latter will be situated 46 mi. away by rail at Beaver Bay.

What Tonnage and When?

It has become orthodox to accompany any discussion of the future of taconite with an analysis showing how much steel will be required in the United States in 1960, 1970, and 1980, how much iron ore to make that steel, and where the ore will come from to make up any deficiency as Mesabi reserves shrink. The result has been a multitude of estimates that have at times been confusing.

For this summary it is enough to consider the current decade. Table 3 gives figures prepared by the Bureau of Mines. The Bureau estimates that to meet an indicated increase of 32,000,000 tons in the iron ore requirements of 1960, compared with 1952, the steel industry will have 35,000,000 tons less of direct-shipping Lake ores. This deficiency will be made up largely by concentrating more lean ores, the output of concentrates including 15,000,000 tons made from taconite, as compared with 500,000 tons of taconite concentrates in 1952.

It appears likely to this editor that, barring the possibility of another world war, the Erie and Reserve plants will not attain their full projected capacities, respectively 10,500,000 tons and 10,000,000 tons per year, until sometime after 1960. The reasons are:

1. Initial production is not expected before 1956 or 1957.

2. Erie will have roughly half of its total capacity completed in 1957; Reserve 37½%.

3. A year or two, possibly more time, will probably be allowed to observe the success of operation of the capacity built before making additions to it.

4. Additions, when finally decided upon, will take several years to complete.

5. Last but not least, the current shortage of technically trained men and the small number of students now in mining schools may prove a deterrent in staffing these large plants adequately.

How rapidly U. S. Steel's Oliver Iron Mining Division will step up the scale of its work on taconite cannot be guessed. If the company's Lake Superior ore reserves are large, so are its ore requirements for steel making in the Central area. The company officials also probably desire to obtain as much as possible of the ore needed for the Central area in the Lake Superior region. So it is readily seen that the company has a serious interest on its own account in the production of iron from taconite, in addition to its desire to safeguard the Range communities. The big question as to increasing its production of iron from taconite is "When?"

MAGNETITE CONCENTRATES, on being pelletized, are oxidized to hematite, the heat released by this chemical change reducing the amount of fuel required to burn pellets to the proper hardness.

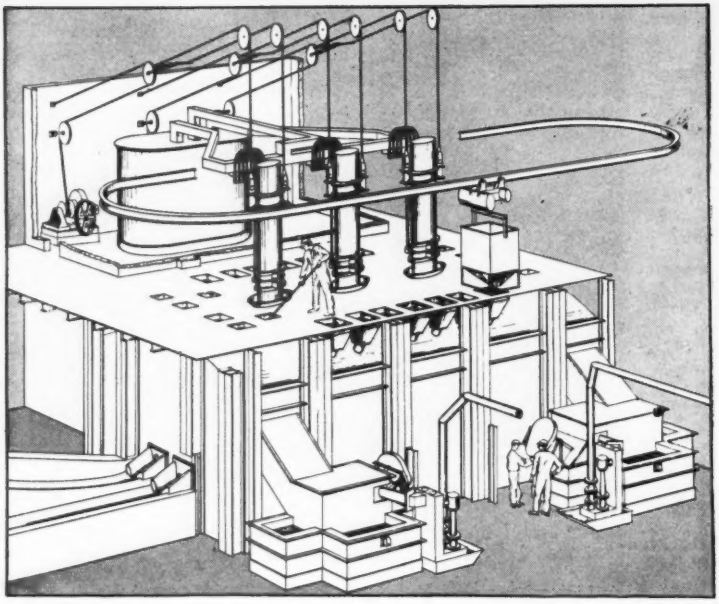
As for the Humboldt enterprise, based on Michigan jasper, it is understood that the agreement between Ford and Cleveland-Cliffs is limited to two units. With the second in commission in 1955, the combined output will be 400,000 tons of concentrates per year.

It is too soon to attempt to evaluate the Groveland investigation. Its potentialities are unknown outside the Hanna organization. Some details of the flowsheet as worked out to date are given in the news pages of this issue.

The initiation of other large projects, comparable to those of the Erie and Reserve companies, is not anticipated in the current decade, always barring the possibility of another world war. If there are companies or interests that are quietly nursing such plans, no inkling has gotten out. It would be difficult to name any who might be interested to the point of plunging into new similar enterprises of great magnitude, before the industry knows how the present projects will turn out.

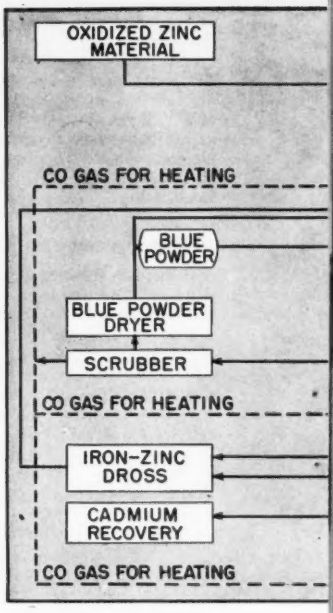
Ten Million Tons Minimum

Based on the foregoing assumptions, we present our own estimate in Table 2 of 10,150,000 tons as the probable minimum 1960 production of concentrates made from Minnesota taconite and Michigan jasper. Should Erie decide to build its entire projected capacity at once, the 1960 total output of concentrates would be perhaps 5,500,000 tons larger. A similar decision by Reserve and an increase in Oliver's production would boost the total still higher. Such considerations have doubtless been responsible for the variation in estimates between 10,000,000 and 20,000,000 tons for 1960 that have appeared in the last year or two. Of 10,000,000 tons we can be reasonably sure.



The Furnace

The Sterling Process solves the problem of getting full use of the electric arc's high temperature (3000—4000 deg. C.) when furnace contents must be below 1450 deg. C.



The Flowsheet

Basic elements of the process are (1) zinc is reduced

Sterling Furnace Smelts Zinc

Here is New Jersey Zinc Co.'s patented Sterling Process for smelting zinc ores with heat supplied by an electric arc. It is the first successful application of ideas generated by years of experiment.

IN JULY, 1951, The New Jersey Zinc Co. began the first full-size furnace smelting of zinc ores, using heat generated by an electric arc to carry on the reduction. Since then the Sterling process has been used on a range of feeds from the crude ore of the company's Sterling Mine, to high grade zinc concentrates, producing zinc metal, pig iron and accompanying by-products.

Focal point in the Sterling Process is the furnace. With full recirculation of condenser and scrubber blue powder, skimmings and dross, the furnace will produce over 35 tons (metal) per day from 50%, or better, zinc concentrate, containing as high as 15% iron. So far, sustained runs have been made with only 4500 kw. of the furnace's 6000 kw. transformer capacity. An important innovation is that furnace reactions take place between 1300 deg. and 1350 deg. C. as compared with 1050 deg. C. in usual practice, thereby producing molten slag instead of a dry residue.

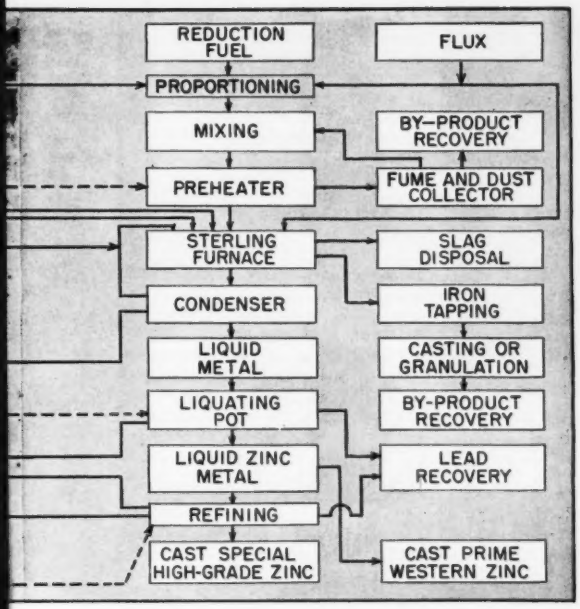
The Furnace

Basic features of the Sterling Furnace are (1) that most of the zinc content of the charge is reduced before the gangue melts to a slag; and (2) that there is no direct contact between the electric arc and the charge. There are two ways to achieve these conditions.

First the arc can be submerged in molten slag. Heat is transferred through the slag and most of the zinc reduction takes place at the interface of the slag and the solid charge. This means supplying a lot of heat to a mobile slag which is hard service for furnace walls.

A second method is to heat the furnace by open arcs between the electrode and the surface of the molten slag. Heat reaches the charge by direct and indirect radiation and zinc is fumed off at the surface of the charge before it melts to slag. In practice, New Jersey Zinc uses a combination of both methods, but prefers to reduce the zinc primarily by open arc radiation.

One of the problems the furnace



Operating Data

CAPACITY: Better than 35 tons per day of slab zinc when treating a 50% or better grade zinc concentrate carrying as much as 15% iron.

RECOVERY: 95% recovery is obtainable on the above concentrate.

POWER CONSUMPTION: Does not exceed 3,000 kwh, including all electric losses, per net ton of slab zinc produced. Auxiliary power is estimated at 150 kwh, per ton.

ELECTRODE CONSUMPTION: 13 to 15 lb. per ton of zinc metal.

DOWN TIME: Operating time (power on electrodes has been maintained at 90% to 95%).

CONDENSER EFFICIENCY: With high grade concentrates, 75% to 80% of zinc vapor entering the condensers will be tapped as molten zinc.

Metal Recovery

Metal	Iron Tapping	Zinc Fume	Recovery Method
Zinc		X	Condensing, Liquating and Refining
Iron	X		Casting or Granulating
Copper	X		Treating in reverb, converter or blast furnace
Gold	X		Treating in reverb, converter, or blast furnace
Lead		90%	Most in Liquation; remainder in Refining
Cadmium		90%	Refining
Silver	1/3	2/3	(Iron) Same as gold; (Zinc) Refining

before the gangue melts to slag; and (2) there is no direct contact between the electric arc and the charge.

with Electric Arc

solves is the practical use of the electric arc's intense heat. The arc temperature is 3000 deg. C. to 4000 deg. C., but the furnace contents have to be kept below 1450 deg. C. to avoid reducing the gangue and overheating the refractories. This can be done because the charge banked around the walls of the furnace absorbs the radiated heat for the endothermic reaction. The agitated, fluid slag also distributes some of the arc's heat to the charge floating on its surface. The high temperature zone is confined to the center of the furnace, limiting damage to refractories. By establishing steady charge rates and power input, reaction can be controlled so that the flow of fume and gas to the condenser is constant, giving good condenser efficiency.

The Flowsheet

Wet or dry, zinc ores or concentrates, fuel, and flux must be carefully measured and thoroughly blended. If material is wet, the moisture content must be taken into account in proportioning the charge. Sizing is not a serious problem. Coarse feed having a screen size of 95% minus ½ in. and 95% on 200 mesh, as well as fine ores, 95% minus 8 mesh and 30% minus 200 mesh, have been successfully smelted. However, the mixture of ore, fuel and flux must not segregate on preheating and charging; the dust must be held to a minimum; there must be good contact between flux, fuel and ore; and the angle of repose of the charge along the furnace walls must not be too small.

Chemical requirements of the charge are not too rigid. Although ores containing lead, cadmium and copper can be treated, they should not contain more than 1% total sulphur and/or 1% CO_2. The furnace has successfully treated ores with zinc-to-iron ratios varying from 1:1 to 20:1. Fuels with 2% to 6% volatile matter and 20% ash have been used but fixed carbon should run anywhere from 60% and 80%.

Preheating the charge takes about two hours in a rotary preheater fired with CO gas, a by-product of the reducing operation. When the temperature is raised to 850 to 900 deg. C., some volatile matter is removed from the coal; some Fe_2O_3 is reduced to FeO; and CuO, if present, becomes Cu_2O or Cu. Any ore and coal dusts, and some zinc, lead and cadmium fume are collected in a mechanical bag filter and recycled. If metallic values are high enough, however, they may be collected at the bag filter.

Leaving the preheater, the mixture is collected in insulated holding hoppers from which it is charged to the Sterling Furnace, 2 to 3 tons at a time, in an insulated charge car riding on a mono-rail. The charge feeds directly into the furnace through a series of hoppers in the furnace roof, along the inside of the four walls. Recirculation of by-product blue powder and dross is handled the same way.

The furnace is charged every

IRON IS TAPPED, 5 to 10 tons at a time, goes to sand casting, right. Slag goes to granulating pit, left. Zinc, lead, cadmium, leave furnace as fume.

hour. Height of charge banks and width of molten bath, as measured by rods inserted in probe holes, determine the distribution of the charge. Power input dictates the amount of charge.

Molten slag and iron collect on the furnace hearth, surrounded by the charge banks. In the molten bath, there should be enough iron to protect the hearth and permit 5 to 10-ton taps. Sufficient slag is carried over the iron to prevent direct contact of the electric arcs with the iron. Iron and slag tapping intervals depend on the composition of the ore worked. Iron is sand-cast, and the slag granulated.

Zinc vapor, lead, cadmium and some silver volatilize and with CO leave the furnace through refractory connectors passing into splash type condensers. Liquid metal collected in the condenser sumps is kept at 500 deg. C. by thermostatically operated water coils. Constant level is maintained by continuous overflow or by periodic tapping into a ladle.

Non-condensable gas, mostly CO, goes from the condenser to a scrubber where fine water sprays remove solid materials. From here the gas passes through a water venturi. The venturi automatically controls back pressure on the furnace and moves the clean gas to the preheaters and liquating pots. Blue powder from the scrubber and condenser is returned to the furnace.

Lead and iron are removed from the molten metal in a blending and liquating pot. The resulting zinc, depending on the impurities, may meet Prime Western specifications. If a higher grade is called for, or if other metal values in the zinc warrant extraction, the liquated metal goes to the refinery. Iron dross from the liquating pot, after granulation or casting, is fed back to the Sterling furnace.

Zinc Chemistry

Before going into the factors that determine the successful operation of the Sterling process, let's review briefly the fundamental reactions in zinc metallurgy.

$$ZnO + C \rightleftarrows 2\ Zn\uparrow + CO_2$$
$$CO_2 + C \rightleftarrows 2\ CO$$

Reduction of ZnO is carried on at about 1050 deg. C., or about 140 deg. C. above the boiling point of zinc, so that the metal is in vapor form. Both reactions above are reversible. CO_2 will reoxidize zinc in cooling, but fortunately, CO does not go back to CO_2 in significant amounts without a catalyst.

In the presence of carbon, CO_2 decreases as the temperature increases; therefore in the reaction (2) above, the products must be removed at as high a temperature as possible.

For Best Smelting

There are five key points to be stressed in obtaining the best results from the Sterling Process:

Correct Amount of Reduction Fuel must be charged to the furnace. The amount of carbon theoretically required to reduce zinc, lead, cadmium and part of the iron, is added. It's a good idea to leave from 1.5% to 6% of the iron unreduced. At the high temperature of the arc, lime, silica, and magnesia from the slag might reduce and/or volatilize. In the furnace atmosphere they would form nuclei on which zinc vapor might condense to form blue powder. But if some iron oxide is left in the slag, this will be reduced in preference to the trouble-making ingredients.

On the other hand, if iron oxide is more than 6%, it will decarburize the molten pig iron and produce an iron which cannot be tapped satisfactorily at the furnace temperature. In addition to controlling iron oxide content, coal, if added in excess would accumulate to interfere with furnace operation.

Composition of the Slag must be carefully controlled for proper fluidity at operating temperatures. Lime or silica is added, depending on the composition of the ore, to maintain a $CaO:SiO_2$ ratio between 0.8:1 and 1.4:1. This allows sufficient fluidity at 1300 deg. C.—1350 deg. C. for reduced iron globules to settle through the slag, and makes tapping easy. Slag fluidity and mobility are also important for distributing heat from the arcs to the charge and molten iron.

A Minimum of CO_2 should be allowed in gasses passing from the furnace to the condenser.

Unnecessary Dilution should be avoided.

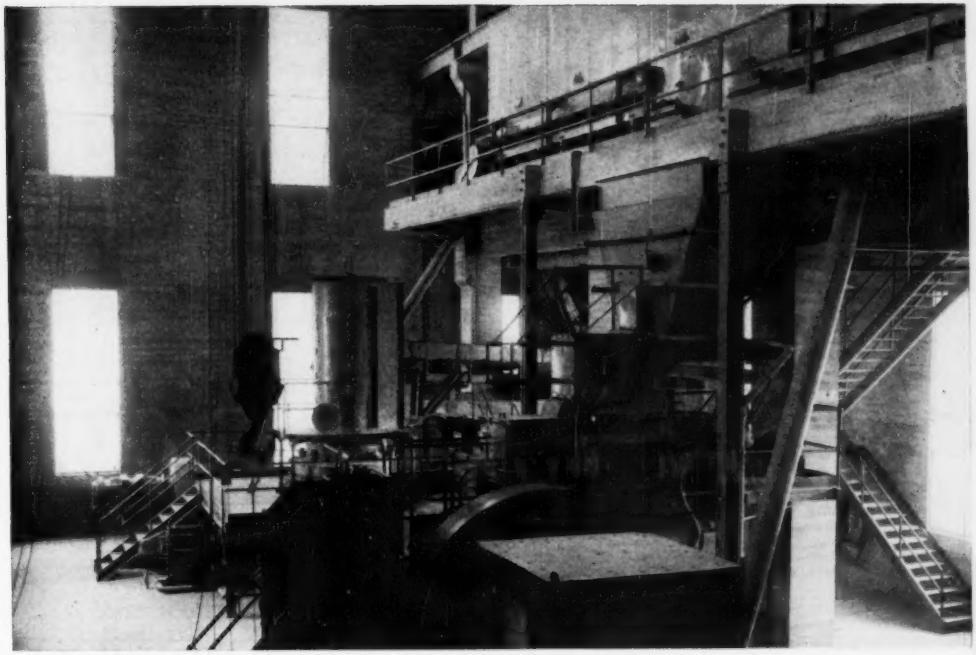
Preheating is important here. First by reducing some of the higher oxides of iron, it decreases dilution. Second, as the zinc-vapor-CO mixture leaves the furnace, it doesn't contact a cold charge, which would favor reversion of CO to CO_2. Preheating also means a saving in power.

Control of Condensing Temperature is necessary for efficient operation. In the splash type condenser, gases pass through a shower of molten zinc maintained at 500 deg. C., by water-cooled coils immersed in the zinc bath. The condenser walls are insulated, not cooled, so that most of the heat liberated in cooling the gas and condensing the zinc, is absorbed by the zinc shower. In this way there is a maximum condensation of metal vapors as liquid metal rather than as solid blue powder.

Report based on information prepared by E. C. Handwerk, G. T. Mahler, and L. D. Fetterolf, of The New Jersey Zinc Co.

Sterling Process is covered by U. S. Patents Nos.

2,598,741 E. C. Handwerk, G. T. Mahler
2,598,742 E. C. Handwerk, G. T. Mahler
2,598,743 R. K. Waring, L. D. Fetterolf, T. L. Hurst
2,598,744 E. C. Handwerk, G. T. Mahler



DUST CONTROL, RATHER THAN DUST REMOVAL, is emphasized in the Hollinger mill where fans, cyclones, and steel enclosures around rolls, crushers, screens, feeders, conveyors, etc. keep the dust count low.

How the Hollinger Mill Solves the Dust Control Problem

P. J. DUNLOP
Ventilation Engineer
Hollinger Consolidated
Gold Mines, Ltd.
Timmins, Ont.

BASIC FACTORS considered in designing the highly effective dust control system at the crushing plant of the Hollinger Consolidated Gold Mines, Ltd., Timmins, Ont. were as follows:

1. High concentrations of dust particles smaller than 5 microns (5/25,000 in.) are injurious to health if a person is exposed to them sufficiently long.

2. Excess quantities of dust also cause excessive wear and reduce operating efficiency of expensive mill machinery.

3. High dust concentrations exist where ore is being crushed, screened, or transferred from one machine to another.

4. Dust generated at these points will circulate around the entire mill and settle out on all surfaces, unless collected.

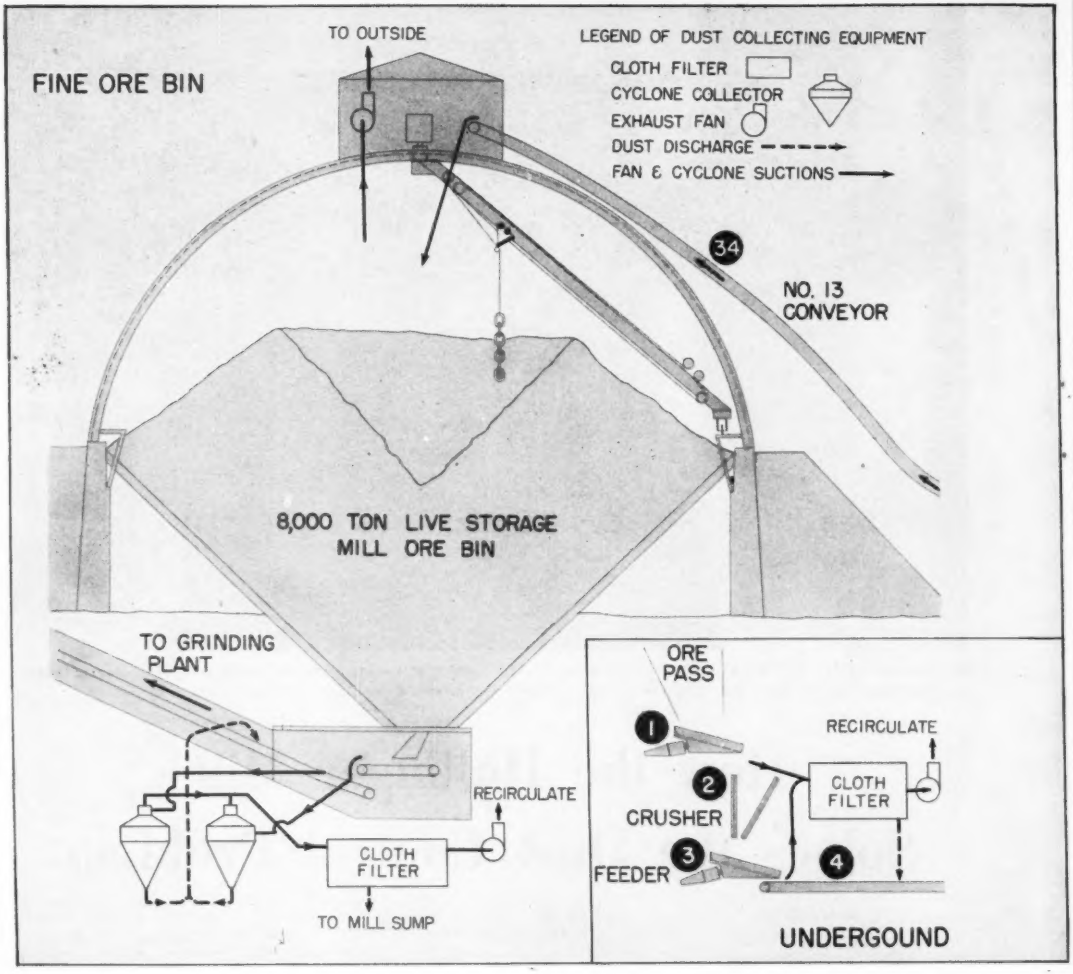
Recognizing the above factors, the Hollinger staff explored every possible avenue of eliminating dust before building the present crushing plant. This research resulted in the design features illustrated in the accompanying dust-control flowsheet. When the new crushing plant was finally started, tests showed that dust counts had been reduced from a possible 20,000 particles per cc to less than 100 particles per cc.

The present crushing plant is designed to crush 440 tons of dry rock per hour. Maximum size of feed to the plant is 6 in. and the final product of the plant after crushing is $\frac{3}{16}$ in. (See flowsheet of mill and dust control system on next page.)

All dust producing machines in the crushing plant are tightly housed and are "in-draft." Units enclosed include all crushers, rolls, screens, conveyor transfer points, crusher and roll discharges, and mine ore bins into which the skips dump.

For conveyors, tests have shown that the inward flow of air must be at a velocity proportionate to the outward speed of the conveyor. For example, if a conveyor is carrying ore out of an enclosure at a velocity of 350 fpm, the inward flow of air through the same opening must be at a minimum velocity of 450 fpm to prevent dust within the enclosure from escaping. To achieve this inward flow of air, it is necessary to remove air from within the enclosure at a specified rate.

Total volume of air exhausted by fans from the crushing plant is about 100,000 cfm. About 60,000 cu. ft. of this total goes out by way of ventilation fans in the roof, and the balance is removed from around equipment units through cy-

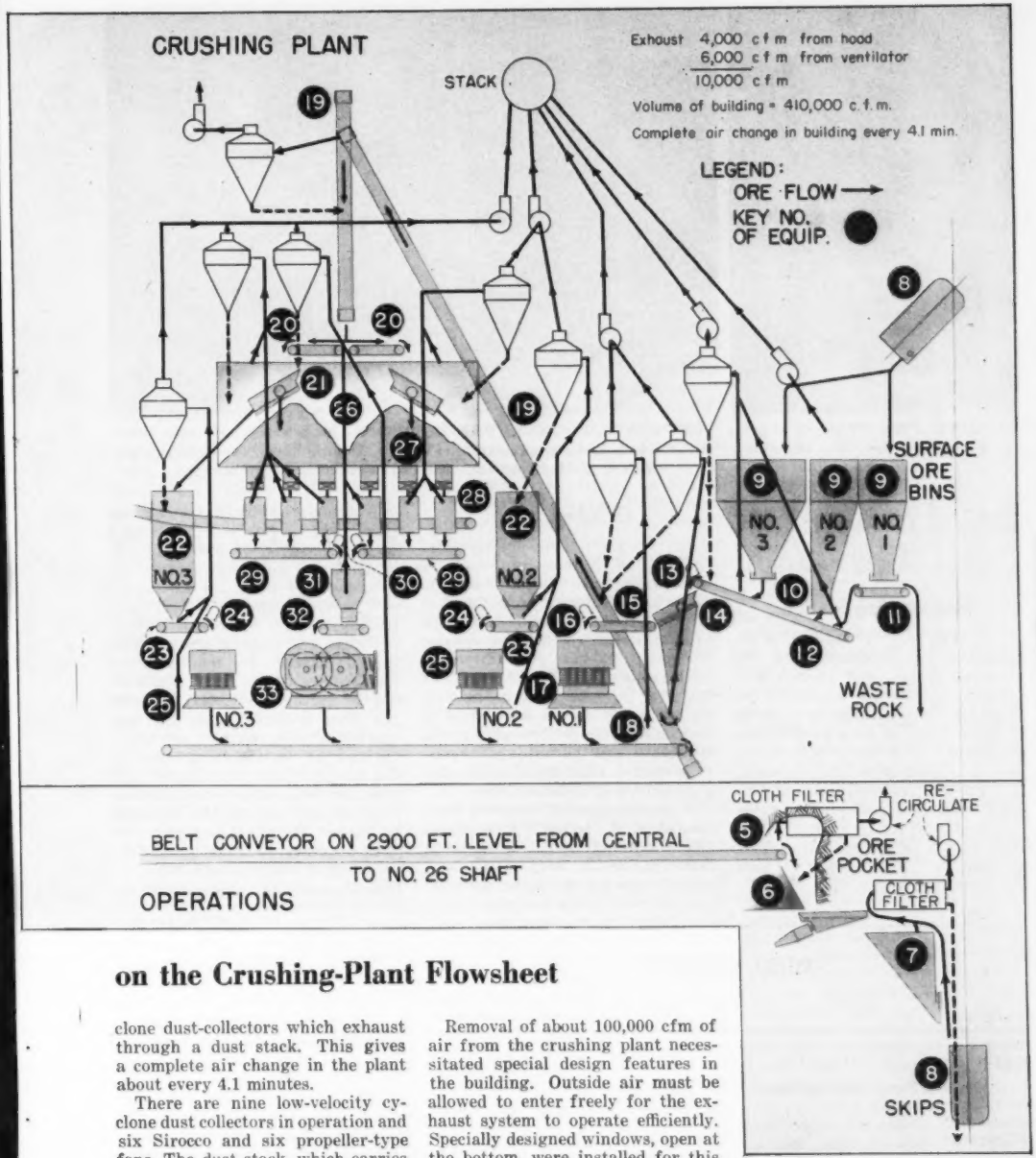


Hollinger's Dust-Control Flowsheet Superimposed

Equipment installed for loading, hoisting, and crushing ore

Key (Key numbers appear in circles.)

1. 5 x 6-ft. vibrating feeder.
2. 48 x 60-in. jaw crusher. 500 tons per hour.
3. 3 x 7-ft. vibrating feeder.
4. 36-in. belt conveyor.
5. Crushed-ore pocket. 600 tons, capacity.
6. Two 4 x 12-ft. vibrating feeders.
7. Four 6½-ton measuring and loading hoppers.
8. Four 6½-ton skips.
9. Three surface ore bins.
10. Three 3½x5-ft. vibrating feeders. (Nos. 1,2,3)
11. 48-in. reversible belt conveyor. (No. 1)
12. 48-in. belt conveyor. (No. 2)
13. Suspended electromagnet.
14. 5 x 8-ft. double-deck vibrating screen. (No. 1)
15. 36-in. belt conveyor. (No. 3)
16. Suspended electromagnet.
17. 7-ft. Symons cone crusher. (No. 1)
18. 48-in. belt conveyor. (No. 4)
19. Two 48-in. belt conveyors. (Nos. 5 & 6)
20. Two 48-in. belt conveyors. (Nos. 7 & 8)
21. Two 6 x 14-ft. vibrating screens. (Nos. 2 & 3)
22. Two 80-ton oversize bins. (Nos. 2 & 3)
23. Two 30-in. belt conveyors. (Nos. 11 & 12)
24. Two suspended electromagnets.
25. Two 5½-ft. Symons short-head cone crushers. (Nos. 2 & 3)
26. 200-ton screen ore bin.
27. Six roll feeders. (Nos. 4 to 9, R. to L.)
28. Six 5 x 10-ft. vibrating screens. (Nos. 4 to 9, R. to L.)
29. Two 30-in. belt conveyors.
30. Two suspended electromagnets. (Nos. 9 & 10)
31. Roll-feed surge bin. 10-ton capacity.
32. 30-in. conveyor belt.
33. 78 x 20-in. rolls.
34. 30-in. belt conveyor. (No. 13)



on the Crushing-Plant Flowsheet

clone dust-collectors which exhaust through a dust stack. This gives a complete air change in the plant about every 4.1 minutes.

There are nine low-velocity cyclone dust collectors in operation and six Sirocco and six propeller-type fans. The dust stack, which carries away fine dust not collected by the cyclone, is 6 ft. x 3 ft. x 82 ft. 6 in. high and passes up through the shaft house. Actual point of discharge is about 135 ft. above the ground level. Dust going up the stack is all minus 20 microns. In the dust collecting system the air velocity in the pipes is about 2,800 fpm.

Removal of about 100,000 cfm of air from the crushing plant necessitated special design features in the building. Outside air must be allowed to enter freely for the exhaust system to operate efficiently. Specially designed windows, open at the bottom, were installed for this purpose.

Dust control measures are not confined to the crushing plant at Hollinger. In fact dust control starts at the underground crushing station and carries right on through to the grinding plant as the following paragraphs covering underground operations and the grinding plant will reveal.

Jaw Crusher—2900-ft. Level

The jaw crusher station at Central Shaft is located adjacent to a mine crosscut. In this station, a bag filter is in operation and the air recirculated amounts to 4,500 cfm. A Sirocco-type fan is used and is driven by a 5-hp. motor. The air in

CYCLONES PICK UP DUST at critical points and return it to the milling circuit.

DUST CONTROL STARTS UNDERGROUND. This is an enclosed skip dump station which prevents circulation of dust in working areas. See flowsheet for details of filters and fans installed in underground operations.

the station is changed every 4½ minutes. Dust counts on the operating floor average 107 particles per cc, and for the filter discharge, 40.

Skip Loading Station

The skip loading station is installed at No. 26 shaft. Here, the ore-pass chutes, pan feeders and hoppers are tightly enclosed; the skips are fitted with hoods in order to bring them in as a part of the enclosure while they are being loaded. A bag-type filter is used, and air recirculated amounts to 3,500 cfm. A Sirocco-type fan is used and is driven by a 5-hp. motor. Dust counts on the operating floor average 141 particles per cc, and the filter discharges, 75.

Grinding Plant

In this plant there are two dust control fan systems and a set of ventilation fans. One system employs a bag filter to draw the dust off the ore feeder belts under the ore bin. Before the dusty air passes to the bag filter, it goes through a cyclone dust-collector. The air from the filter is recirculated in the winter time, and in the summer it is discharged outside through a stack. On this circuit the fan is a Sirocco-type with a capacity of 6,000 cfm. It is driven by a 5-hp. motor.

A second system removes dust created at the ball-mill feed scoops and discharge ends. Dust from these points is very damp and would cause trouble in the filter, so it is discharged outside through the stack. The fan is a Sirocco type with a capacity of 6,000 cfm. It is driven by an 11-hp. motor.

In the roof there are three propeller-type, ¾-hp., 5,000 cfm. ventilating fans.

During the summer all the air is turned outside. To maintain the temperature of the plant above 50 deg. F. during the winter, air from the filter is recirculated, the ventilating fans in the roof are taken out and the ventilators closed. The fan drawing from the ball-mill feed scoops and discharge ends continues to discharge outside the building. In winter the air change in the plant is every 35 minutes, and in the summer every 15 minutes.

Dust Counts:	Summer	Winter
	(Particles per cc)	
Under the ore bin ..	60	113
Ball-mill operating floor ...	65	134
Filter discharge ...	75	—

In summary it will be noted that the major emphasis at Hollinger is on dust control, not dust removal. The basic approach to the whole problem has been to collect the dust as soon after it has been formed as possible, and then return it to the enclosed belts and units which make up the flowsheet. By this process, the dust eventually works its way out of the plant without contaminating the air in the plant. In exceptional places such as galleries enclosing open conveyors, the problem is handled by requiring workmen to wear dust masks whenever they have to enter such places while the plant is in operation.

DUST COUNTS

Locations:	Particles minus 5 microns per cubic centimeter
Headframe—operating floor at skip dump	246
No. 2 conveyor inside crushing plant	235
Crushing Plant—operating floors:	
No. 1 crusher	93
Rolls	74
No. 3 crusher	76
Link-Belt screen floor	90
Junction of No. 7 and 8 conveyors—top floor of crushing plant	94
Closed Conveyors:	
West end of No. 4 conveyor—carrying circulating load	292
Junction of No. 9 and 10 conveyors — delivering ore to roll feed bins	69
Open Conveyors: (enclosed galleries) dust masks are worn when the plant is operating.	
Tail of No. 5 conveyor—carrying circulating load	800
Along No. 5 conveyor	296
Along No. 6 conveyor—carrying circulating load	550

More Core, Lower Cost by Reversing Diamond Drill Water

WARD CARITHERS
Chief Geologist
Calera Mining Co.,
Blackbird Division
Cobalt, Idaho

REVERSING THE WATER circulation in diamond drilling was tried early in 1950 by Calera Mining Co., at its Blackbird mine at Cobalt, Idaho, to improve core recovery. Results were satisfactory and the method has become standard practice there.

By reversing the water is meant passing it down the hole outside the rods and returning it with the sludge inside the rods. The effect is to "float" the core back from the face of the hole into the core barrel. Normal water pressures of 50 to 125 psi are used in flat holes up to 150 ft. long.

Reversing the circulation is not a new principle. It has been done at many places for various reasons. Apparently few operators have adopted it as regular practice. The method is not thought practicable in all soft or broken ground.

Rocks of the Blackbird are strongly sheared, gritty quartzite and argillaceous schist of the Pre-Cambrian series. They are alternately hard and soft, at places sheared and crumpled, and jointed in several directions. The ore occurs as siliceous veins and lenses containing pyrite, chalcopyrite, pyrrhotite, and cobaltite, or as zones of soft, crumpled schist laced by thin cobaltite veinlets.

In normal drilling work, with the water flowing down through the rods, hard quartzite and ore of the siliceous type core satisfactorily except in fracture zones. The crumpled mineralized zones and highly fractured rocks, on the other hand, core poorly and frequently not at all. Prior to 1950, about 14,000 ft. had been drilled in 125 holes with normal water circulation, and core recovery ranged from as little as 5% to more than 90% and averaged about 50% in ore zones. Grinding of the core was common and drilling in general hard on equipment and diamonds. Since the new method was adopted, about 9,000 ft. has been drilled in 186 holes, and all but 12 holes averaged more than 90% recovery. Nine of the 12 holes were drilled in surface-leached material, where reversed water circulation could not be employed. The other three holes were in unusually fractured ground where normal water flow was resorted to rather than cementing.

The equipment used for reversing the circulation is simple. Other than the regular tools used in normal diamond drilling, it consists only of a 2-in. pipe tee-welded to a 2½-ft. length of AX casing and an E-size stuffing box which can be threaded into the tee. An AX core is usually taken at the Blackbird. E rods are fed through the feed screws and drill chucks and are coupled to A rods beyond the collar. Ordinary AX single-tube core barrels of 1 and 5-ft. lengths have been found most satisfactory for reversed water drilling. Bits are four-waterway, straight-walled with no lifters, and are set with 10 to 12 carats of bortz in a hard matrix.

Drill setups are made in the usual manner, and a drill hole is collared with a BX bit and starting barrel. This drilling is done in the normal manner, the drill water being fed through a water swivel and down the rods to the bit. Core recovery in this BX section varies, depending on the rock, and is commonly the only core that may be lost in a hole. After drilling BX size to a depth that penetrates most of the cracks around the drift, usually 2 to 3 ft., the AX casing is set by wrapping the inside end with a small piece of burlap or canvas and driving it into place with a block of wood such as a track tie. This may set the casing for the life of the hole, or it may have to be reset later as drilling progresses and leaks develop. The casing can ordinarily be recovered after the hole is finished and used for other holes.

After the casing is in place, the water hose is connected to the side opening of the tee, the barrel and rods are put into the hole, the stuffing box, through which E drill rods run, is screwed into place. Drilling with reversed water is then started. A short core barrel is necessary until the hole is deep enough to contain a 5-ft. barrel.

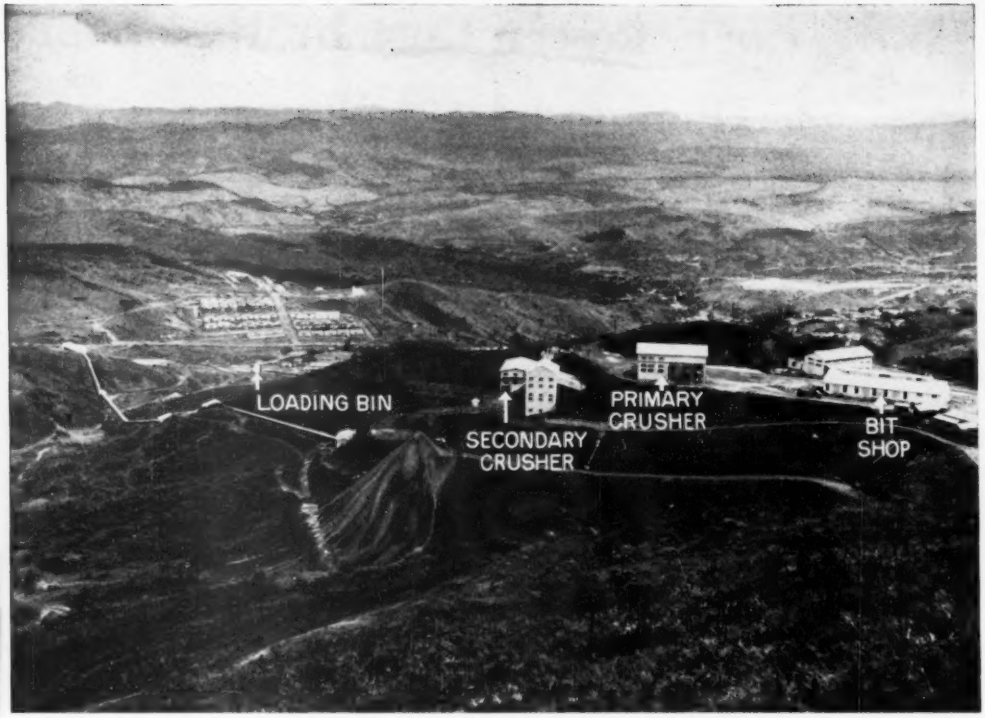
As drilling progresses, the packing gland is tightened just enough to make a seal around the rods. It normally requires ⅜-in. water pump-packing, but, by alternating strips of this packing with gaskets made from ⅛-in. rubber, the gland will last several times as long as with the packing alone; say, for as much as two to three shifts of drilling.

Pressure of 75-100 psi Best

After drilling a short distance, a part of the drill water may find small cracks in the rock and leak into the drift, sometimes as far as 12 or 15 ft. away from the hole. In most holes this loss is not serious, for enough water still passes these cracks and flows around the bit to take care of the drilling operation. Experience has shown that a water pressure of 75 to 100 lb. psi. gives the most satisfactory results for holes up to 150 ft., but some have been drilled up to 75 ft. with pressure less than 50 lb. Greater depths with increased water pressure may be possible, but none as yet have been attempted.

While drilling with reversed water circulation, the driller watches the return water. When the bit is blocked, because the core barrel is full or blocked or too little water is flowing around the bit, the return water stops and the machine labors. Runs generally vary from a few inches in badly fractured ground to a full 5 ft. in the best ground. However, most are from 2 to 4 ft. With normal observation it has been found that it is almost impossible to grind core or to burn a bit. In fact, since the method was adopted there has been a substantial increase in the life of bits and reaming shells, and considerably less wear on all the drill equipment. Cost per foot for bits, operating supplies, and maintenance dropped about 50%, and cost for labor remained about the same as for normal water circulation. This increased efficiency is in addition to the obvious advantages of having reliable results in core analysis and in the nearly complete abandonment of taking sludge samples.

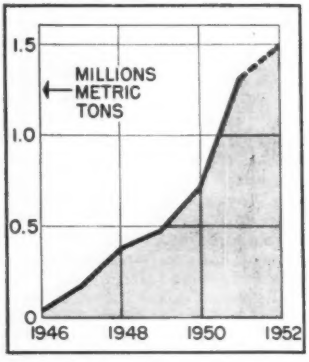
I wish to express appreciation to the staff of Calera Mining Co., particularly to R. L. Soderberg, for advice and assistance in working out the application of this method at the Blackbird.



NEW BELT AND LOADING SYSTEM started operating in September, 1951. Effects will show in 1952's output.

Itabira Is Breaking

JOSEPH K. VAN DENBURG, JR.
McGraw-Hill International Corp.
Rio de Janeiro, Brazil



BIG JUMP in Itabira's 1951 exports is result of an all-out program.

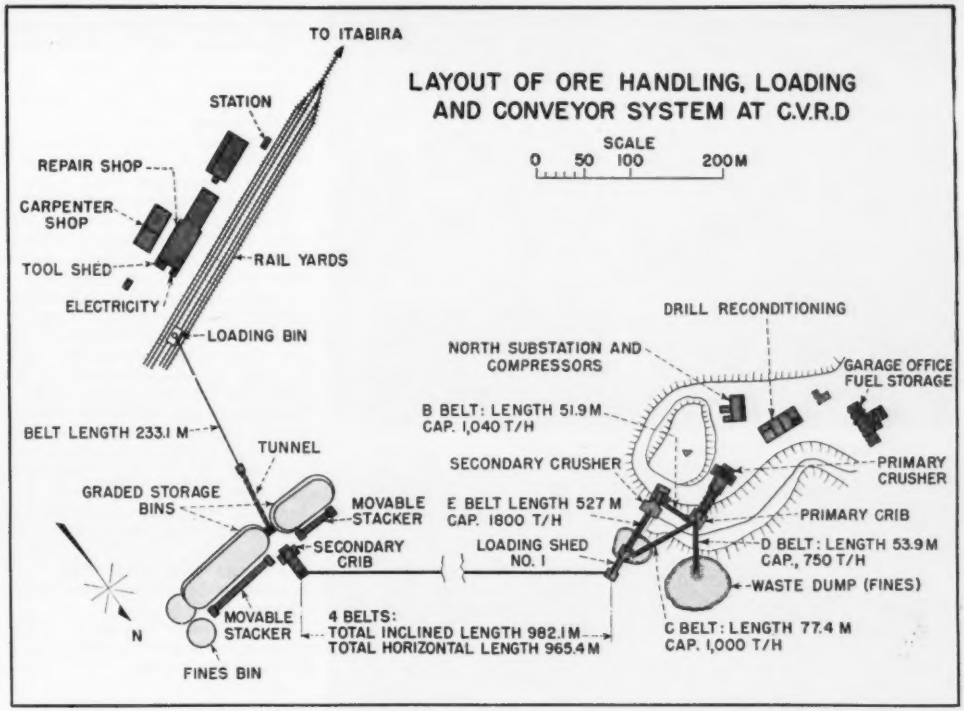
The Background of Cia. Vale do Rio Doce

CVRD WAS ORGANIZED IN 1942 by the Brazilian Government in a three-way deal. The British Government acquired, from previous concession-holders, some 7.5-million square meters of property in the state of Minas Gerais, Brazil; Britain turned the land over to CVRD as its contribution. The Export-Import Bank loaned CVRD $14-million, and CVRD floated Crs.-200-million ($10-million) initial share capital.

Over the years that followed CVRD progressively increased its capitalization to a total of Crs.-650-million, issued 7% debentures to the tune of another Crs.-300-million, and obtained two more Export-Import loans totaling $12.5-million.

Original purpose of this World War II project was to supply ore to Britain. To guarantee a market, the U.S. and British governments contracted to take a total of 750,000 tons each at a price of Crs.-100 ($5) per long ton aboard ship at Vitoria. The three-year contract ended in 1945. So did the emergency, and neither government renewed its contract. After shipping only 321,503 metric tons, CVRD was left without a market.

Now, U.S. buyers, taking about 80% of Itabira's output, are furnishing the motive for modernization.



SKETCH OF SAME SYSTEM shows crusher plants on 1,100-m. level at Caue Peak, and rail loading yards below.

Its Bottlenecks

AT LEAST 1.5-million metric tons of high-grade iron ore should leave the workings of Companhia Vale do Rio Doce this year for the open-hearth furnaces of the United States and Europe. This tonnage would exactly meet the target set up 10 years and $79-million ago.

Production in 1951 was 1,313,611 metric tons—made up of 1,286,586 tons of current production and 27,043 tons of hold-over. Several factors have combined to yield this record output, and to promise the 1.5-million-ton designed output for 1952. They are:

Mechanized mining and ore handling has at last begun at Itabira.

Private contractors working two outcrops of CVRD's holdings are helping to get out the ore, too. They use primitive methods, but have the incentive of a chance for high pay, and account for about half the ore mined.

Smart railroading. Freight charges are steep. The railway department of CVRD charges the mining department $4.15 per metric ton for haulage to Vitoria. Added to mining cost, that brings the total to $6.40 per metric ton f.o.b. Vitoria.

New management of the company under Colonel Juracy Montenegro Magalhaes, who became president of the company under the administration of President Vargas, has apparently given an impulse to the affairs of CVRD. It would be unfair, however, to the former management not to point out that the upturn in shipments was well under way before that change occurred in early 1951.

CVRD Uses Modern Mining

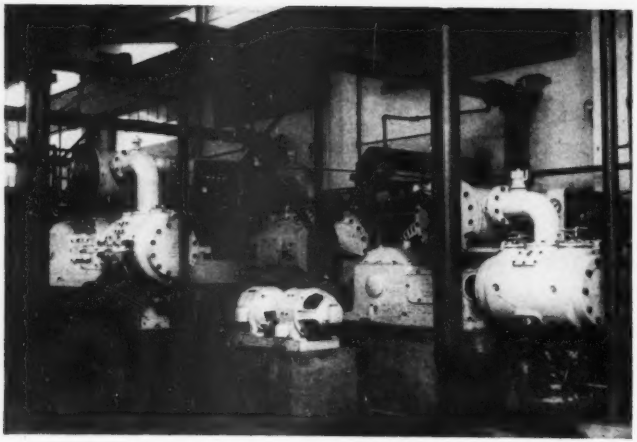
Ore is being mined at three locations on CVRD property. Principal one is Caue Peak, where CVRD has its truck pit, new crushing plant and belt conveyor system. Mechanized mining is scheduled to produce at least 800,000 tons in 1952, and will reach 900,000 if additional equipment can be obtained, according to Francisco A. Fonseca, Jr., mine superintendent.

Two Bucyrus-Erie 42-T churn drills were delivered in 1944, but they did not go into service as drills (though they were used as derricks) until 1950 when the bit-dressing shop was completed. They are equipped with 9-in. bits, and drill to 15-17 m. on the 15-m. benches at Caue Peak. Holes are spaced 1 to 5 m. apart.

Two more 42-Ts are scheduled for delivery in 1952.

For bench development and toe blasting, CVRD uses four Gardner-Denver D-99 wagon drills and three D-89s. Secondary drilling is done with hand drills.

Churn-drill holes are loaded with 8 by 19-in. sticks of Duperial 60% special gelatine, and are detonated with Primacord. Powder



COMPRESSOR STATION on 1,100-m. level supplies air to Caue Peak.

MECHANIZATION now starts at mine and continues through to shipment.

PRIMARY CRUSHING PLANT is ready for second jaw crusher.

consumption is roughly 130 g. per metric ton of broken rock. Each blast breaks 30,000 to 60,000 tons of ore.

Wagon-drill holes are loaded with 1½ by 12-in. 60% dynamite fired by electric caps.

CVRD has six shovels for loading. Two Bucyrus-Erie 54-B electrics are equipped with sub-size 2¼-yd. dippers because of the high ore density; two more are on order. The other four are Northwest shovels of various sizes, equipped with 1½ and 1¾-yd. dippers.

Haulage equipment includes 21 Euclid 15-ton rear self-dumping trucks and seven 30-ton side-dumping semi-trailers which are dumped by a special rig. These units are all old, and for lack of spare parts and skilled mechanics, CVRD seldom has more than half of the 28 trucks in action at any one time. A new fleet of Euclids has been on CVRD's "must" list for some time. Eleven new 20-ton rear-dump trucks are to arrive in 1952.

Haulage roads from Caue Peak connect to the crusher house at the 1,100-m. level.

The average round-trip from mine down to crusher house and back up the mountain is half an hour. Road surface is of compacted hematite fines. Maximum grade is 7%.

Modern Crusher Plant Helps

The crusher plant was set up only last year. Since it started operation only in September, its effect on output and costs was not reflected fully in 1951's figures.

It is a big improvement over the old system:

Now, shovels load Euclid trucks which carry the ore to the crusher plant. From there, it flows mechanically to railroad cars headed for port.

Before, miners pitchforked the hand-broken ore into hand buggies, trammed them to a lower level, and dumped the ore into Euclid trucks which carried it to the loading station at Itabira. Today, that loading station is used only by contractors.

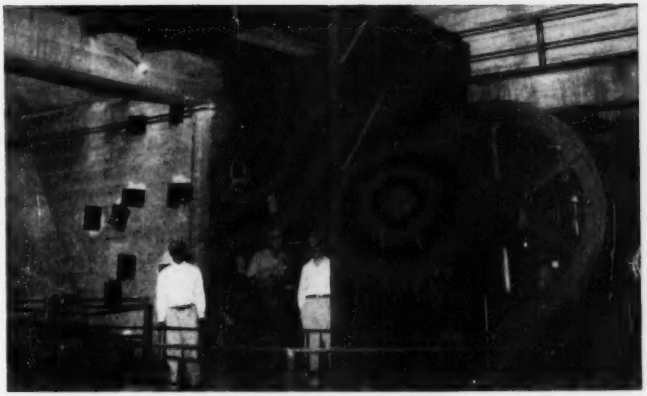
Equipment for the plant was supplied by Robins Conveyors Div. in accordance with designs prepared in 1943-46. Equipment was ordered in 1948 and began to arrive in 1949. Ted Lewandowski, a Morrison-Knudsen man, has been on loan to CVRD to help set up the plant and equipment.

Ore from the crusher plant goes by belt to a special loading bin at Campestre (where the CVRD office

and shops are). Ore trains come from Itabira to Campestre over a 7-km. spur track.

The crusher plant on the 1,100-m. level is an expansion and modification of the original project. Now there are two stages instead of one, and the finished ore for shipping is in the plus-½-in. minus-8-in. range. Trucks arriving at the crusher can dump into either the primary or secondary crusher bins, although the secondary stage is not equipped to handle boulders.

Under normal conditions, they dump into the ground-level bin at the primary crusher house. Draw is by a 60-in. SACO pan feeder which discharges onto a 5-in. grizzly. Heavy anchor chains slow the oversize as it slides into the primary crusher, an Allis-Chalmers 48 by 60-in. jaw unit.



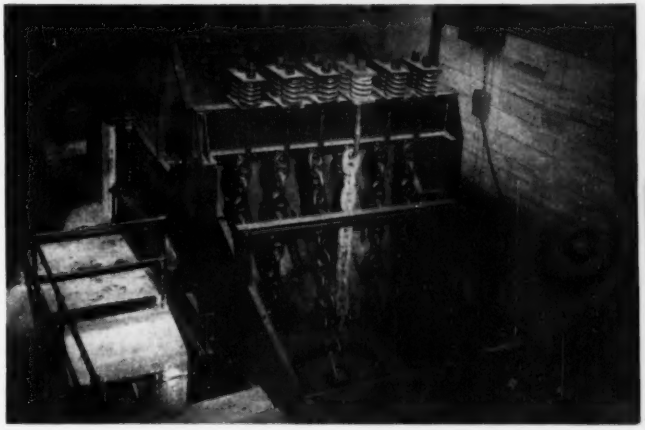
IN PRIMARY CRUSHER HOUSE, Ted Lewandowski (center) talks to Dr. Francisco A. Fonseca, Jr. Ted is Morrison-Knudsen man on loan to CVRD.

Storage Space Ample

Crushed and undersize products join on a 48-in. pan feeder and drop onto "A" belt which carries it to the primary screen house. There, No. 1 primary screen has an 8 by 5-in. top deck and a 3-in. lower deck. Plus 8-in. material chutes to the "B" belt and goes to secondary crushing. Ore from the lower deck is finished product, goes to the "C" belt and out to the surge pile. Fines go to the No. 2 primary screen, 1¼-in. top deck and ½-in. lower deck. Plus ½-in. material chutes onto the "C" belt and goes to the surge pile. Minus-½-in. goes via the "D" belt to the fines stockpile for possible later retreatment; the stockpile is so laid out that a valley more than 1 km. long is available for storage.

The bin at the secondary crusher house is fed by either the "B" belt or by direct truck dumping. Secondary crushing equipment is in two parallel identical lines. One is used, the other is kept as standby. Each consists of a 48-in. pan feeder bringing ore to a screen with a 5-in. top deck and a 3-in. lower deck. Plus-5-in. material goes through a 20-in. Traylor gyratory before dropping to the "E" belt, which discharges onto the finished-product surge pile. Minus-5-in. goes directly to the "E" belt and then to the surge pile. Fines—only about 5% of the total product—go to the surge pile and are screened out at the plant in the valley.

The surge pile holds 6,800 tons. In a concrete tunnel under it, a 48-in. pan feeder serves a 36-in. tunnel belt equipped with a Merrick Weightometer. This tunnel



GRIZZLY at primary crusher has heavy stop chains hanging between bars to prevent damage by loose rocks.

CONVEYOR SYSTEM from secondary crusher includes fines belt (left), tripper conveyor with belt not yet installed, and fines stacker (far right).

AT ITABIRA YARDS, "Mikado" type wood-burning locomotive comes up line to pick up train for Vitoria. Contractors on right are unloading trucks; they work long hours, get family help, make good money, and get out ore.

belt carries ore to a junction and thence to a series of four belts (982 m. total) which run to the secondary screen house down in the valley.

Ore arriving at the secondary screen house chutes onto two parallel 60-in. picking belts which carry it to identical screens. The screens, 3-in. top decks and ½-in. lower decks, separate it into three products.

1. Plus-3-in. product chutes onto a belt system which trips it to the west movable stacker, which in turn sends it into the west bin. That bin is 72 m. long, 12 m. deep, and 23 m. wide.

2. Minus-3-in. plus-½-in. product goes over a similar system to a similar, but longer (137.5 m.) east bin.

3. Fines drop onto a separate belt which carries them east to a pile served by a fixed stacker tower. From there it can be bulldozed into the bin if needed.

The two bins (east and west combined) could hold 200,000 tons, but because of the hillside soil they are not loaded beyond 100,000 tons. Under each bin, ore flows on a cross belt which carries ore from several draw points to a common (to both east and west) belt in a tunnel. This loading belt carries ore to a 1,000-ton bin which straddles two tracks. Railroad cars are positioned by a car-winch, and are loaded in less than 1½ minutes per car.

The belt line to the valley has a designed capacity of 960 tons per hour. During last year's break-in, top performance was 450 tons per hour, and this year CVRD doesn't plan to run more than 500 tons per hour. However, when installation of the second primary crusher unit is completed (perhaps in another two years) the belt will be carrying near-capacity loads.

Seasonal rains are expected to cause at least one month of shutdown each year—probably in the January-to-March period. During the dry season, plant output is nearly up to the railroad's capacity. At that time, contractor's shipments are stockpiled. When the rains arrive, shipments are made up from the contractor's stockpile.

Wet weather presents many problems. According to Ted Lewandowski, five men can handle the plant in dry weather, but it takes 22 men in wet weather—men armed with slicer bars to monitor the chutes and screens, and to chop away accumulations of muddy fines.

Contractors Work Ore By Hand

Though they use primitive methods, the contractors mined 752,211 tons of ore in 1951. CVRD pays contractors by the ton delivered to Itabira. They in turn pay workers on the same basis. Truck drivers are assigned permanently to one truck and eventually own it by having a portion of payments withheld by the contractor. Free of labor laws, a truck driver can work as long and as hard as he wants. In one instance in 1951, a trucker and some relatives drove long enough and hard enough to repay the contractor for three Chevrolet trucks.

The contractors are working on outcrops of hematite on the sides of Conceicao and Dois Corregos hills, to the west of Caue Peak. Longest haul from any of the workings to the Itabira loading station is about 8 km.

They mine with the simplest equipment—hand drills and portable compressors—and they break ore manually wherever possible. Broken ore is pitchforked into

piles (the fines are eliminated in the process), and then hand-loaded onto flatbed trucks. The trucks are, for the most part, 6 and 8-ton models, but usually carry overloads up to 10 tons. They are weighed at the Itabira station and then unloaded by hand directly into ore cars. If no cars are available, the ore goes to a stockpile, from which CVRD loads to the cars.

Rail Transport Improved

Years of work on the Vitoria-Minas Railway—realignment, laying of new track, construction of more sidings, and now the ballasting of an old dirt roadbed which should be completed in about a year—have begun to pay off. During 1950, the last stretches of track in excess of ruling grade and substandard structures were eliminated; and for the first time, the railway sent ore trains to the shipping port without breaking them en route.

Railroad men have cut turnaround time to three days. That, on a 700-mi. trip, is a very creditable speed. At peak shipping season last year CVRD was running five ore trains daily (each of 20 50-ton cars); this year it has been able to step that up to six trains per day.

Ballasting the railway lines is far from complete, but this work is being pushed by the company. Additional classified storage space is needed at the port of Vitoria. Present loading equipment there—as distinguished from storage space—should be able to handle greater tonnages than are now being shipped.

The line is a meter-gage steam-operated one but CVRD's railroaders are bringing out the best in it.

Production and Costs

The superintendent, Mr. Fonseca, supplies these data concerning 1951 operations:

Total excavation on Caue Peak was 902,462 metric tons. Of that, 534,357 tons was shipped; so roughly 60% of CVRD's total excavation is ore.

Average grade for the year was 68.21% iron and only 0.03% phosphorus. Each carload (including production of contractors) is analyzed before shipment.

Total cost per ton of ore ready to roll was Crs.-38.77 per ton (about $1.94). That was split up as follows: Direct cost of mining Caue ore was Crs.-27.37 per ton. For Conceicao and Dois Corregos (contractors) the figure was Crs.-29.07 per ton. Added to these was an indirect cost of Crs.-10.39 per metric ton.

This year, the Mining Department at Itabira will be assessed a share of the costs of the Vitoria ore-loading operation and the costs of general administration at Rio de Janeiro head office. That will bring total cost to Crs.-45 ($2.25) per metric ton f.o.b. train.

The steep freight charges have already been mentioned at some length on page 85.

The Look Ahead

Beyond the obvious fact that the Itabira deposit is good for many more years at the present mining rate, very little is known about its long-term prospects. Because emphasis has long been placed on boosting production, exploration and development have been delayed.

Originally it was claimed that the deposit was practically all compacted hematite. That was far from true. Exploration indicates that Caue has about 45-million tons of hematite (there may be more, but no detailed sections have been made). Dois Corregos promises nearly as much, and Conceicao with its many outcrops may have more than 45-million tons of ore in its reserve.

There is plenty of lower-grade ore. The whole deposit is ore of one kind or another. First in bulk is itabirite, a soft ore made up of layers of silica and hematite. It runs about 46-52% in its iron content.

Then there is "canga" which consists of itabirite enriched and cemented by limonite from surface water. It runs 54-62% iron but is fairly high in phosphorus. CVRD shipped 10,000 tons of it last year to a small blast furnace in Vitoria. It ran 55.01% iron and 0.134% phosphorus.

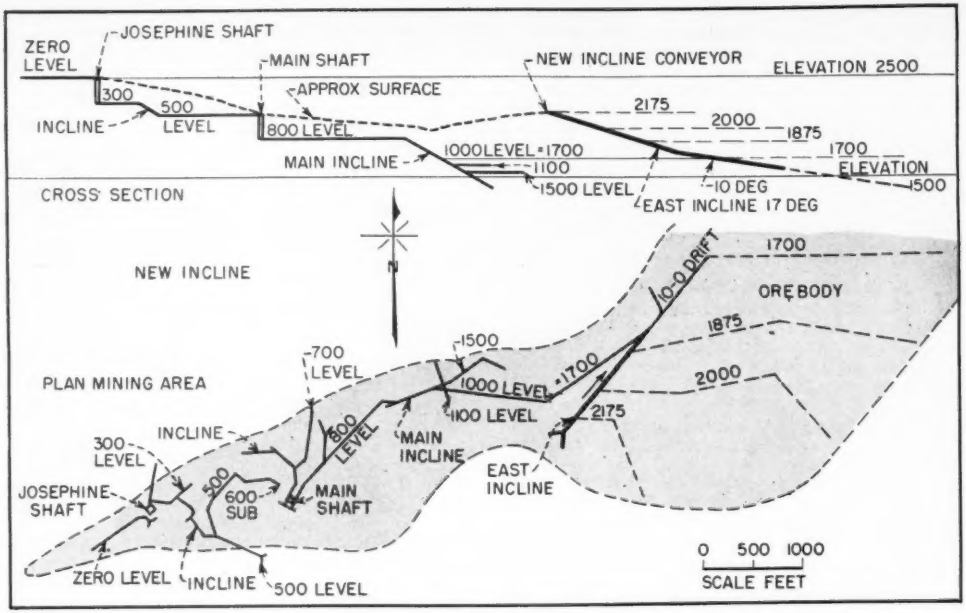
Finally there are sections of rubble ore consisting of hematite boulders and pebbles cemented by limonite from surface water. It assays 64% iron and 0.06% phosphorus.

According to V. E. Frank, U.S. operating chief of the Itabira workings, rubble ore and canga together may total as much as three times the volume of compacted hematite. Itabirite would run twice again as much, or six times the volume of hematite. He emphasized, however, that it would be years before anyone knew what the exact proportions and tonnages would be.

The future looks good. The company is now studying the possibility of increasing its production of high-grade iron ore to 3-million tons per year.

New Tank Barges for Molten Sulphur

SIX STEEL TANK barges like this one being launched at New Orleans will be used by Freeport Sulphur Co. to transport molten sulphur from new mines in Louisiana marshland to storage at Port Sulphur on the Mississippi. Barges will cost $150,000 each, are 224 ft. long. Steel cylinders of 1,000-long ton capacity, built into barges, are wrapped in insulation blanket and encased in steel canopy to protect them from high water when using Gulf Coast waters. *New Orleans Times-Picayune photo.*



VERTICAL HOISTING VS. INCLINED CONVEYORS. One man operating incline conveyor system in the East Incline transports 800-ton-per-day output to the surface in about two hours. Similar job at Josephine property on the west bank of the Pend Oreille River (left) required 20 men two shifts to hoist a like tonnage.

Pend Oreille's Incline Conveyor Reduces Ore Hoisting Costs

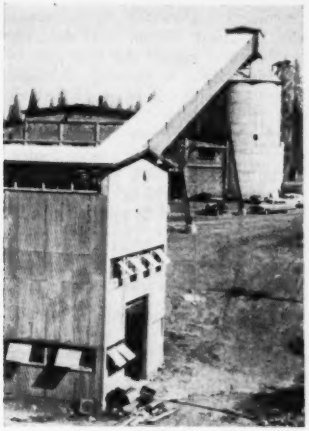
New conveyor transports ore from underground storage to concentrator at a cost of 6¢ per ton on an 800-ton daily production basis. Costs as low as 4¢ per ton are expected on a 2,400-ton schedule. This article also tells how to prevent damage to expensive belt installations with effective electrical control equipment.

N. H. RAYNER
Chief Electrician
Pend Oreille Mines & Metals Co.
Metaline Falls, Wash.

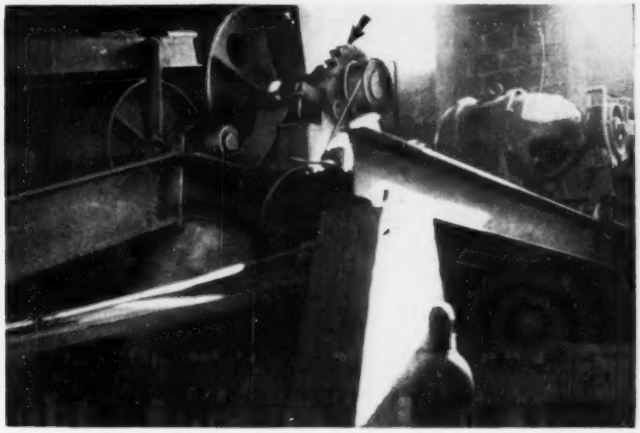
WHEN PEND OREILLE Mines & Metals Co. planned its present operations on the east bank of the Pend Oreille River near Metaline Falls in 1946, it estimated that construction and operating costs for an inclined shaft and conveyor system would be much lower than for a vertical shaft and hoisting system. These expectations have been fully realized. After one year of operation, the entire 800-ton daily production of the mine can be transported from underground storage to the concentrators in little more than two hours, with only one man supervising belt operations, greasing idlers and cleaning. Contrast this to a crew of 20 men employed on a two-shift basis to hoist a like tonnage in the company's Josephine mine on the western bank of the river.

Hoisting costs are about 6¢ per ton, and are expected to drop as low as 4¢ per ton when the mine reaches a 2,400-ton-a-day production basis. In addition, the inclined conveyor installation is more flexible than a vertical shaft because belt extensions can be added to follow any changes in pitch encountered in the orebody at depth.

The conveyor system consists of two divisions: (1) the belts operating in a 17-deg. incline 1,500 ft. long and a 1,200-ft. extension on a 10-deg. slope serving the 1,700 and 1,600-ft. levels; and (2) the train



BELT CONVEYOR connecting crusher with 1,000 ton fine ore bin.



RATCHET AND PAWL on head sheave of incline mine conveyor, prevent belt reversal in event of mechanical failure. A solenoid operates the steel pawl.

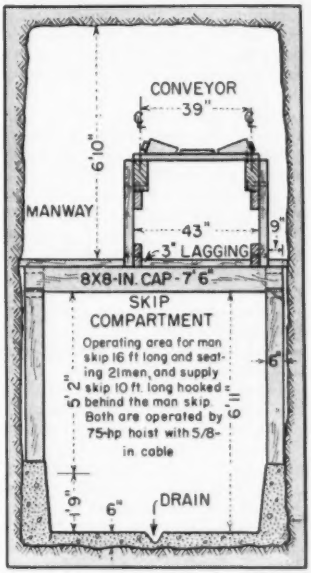
of belt conveyors transporting ore from surface storage via a secondary crushing plant to the concentrator.

The main slope system will ultimately comprise five belts and a like number of loading stations, all controlled by one man from any one station. A loading station contains a pocket blasted into the rock above the primary crusher with a capacity of 100 tons of ore or waste; a 15x30-in. Traylor jaw crusher set to produce a minus 3-in. product; a 1,000-ton crushed ore storage pocket with a Traylor vibrating pan feeder; and a 150-ft. transfer belt discharging onto the main incline conveyor leading to the surface. Within the limit of his shift the operator in charge can empty stored ore and waste at each loading station successively.

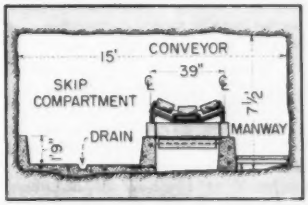
Main Slope Is 17 Deg.

The 17-deg. incline in which the first section of the belt operates is 7½ ft. wide and 15 ft. high in cross section. It is divided into two compartments, with the upper compartment containing the belt and the lower being used for haulage supplies and handling men (see drawing). The 1,200-ft., 10-deg. extension previously mentioned was driven with a cross section 15 ft. wide and 7½ ft. high—a standard for all future extensions.

The belt is a Goodyear 125 compass cord 30 in. wide, and troughing return idlers, and head and tail pulleys are of Link-Belt design. Distance between the centers of the head and tail pulleys is 1,421 ft. The second belt operating in the 10-deg.



CROSS SECTION of 17-deg. incline (upper 1500-ft. section of East Incline).



CROSS SECTION of 10-deg., 1,200-ft. lower extension of incline shaft.

incline extension is of similar design and measures 1,180 ft. between pulley centers. Capacity of the first slope is 350 tons per hour. It travels 450 fpm with a total lift of 400 ft. At any one instant, the fully loaded belt will have about 18 tons of ore, or waste, distributed along the hoisting surface.

Ratchet Prevents Back-Up

Power is provided by a three-phase, 2,300-v., 200-hp. wound rotor motor, automatically accelerated in eight steps. A thrustor-operated, spring-loaded brake mounted on the motor shaft controls normal roll-back of the belt. In the event of mechanical failure, a ratchet and pawl are provided on the head pulley shaft to prevent belt reversal. Normally, the pawl is held open by a solenoid to avoid chatter during operation. A zero speed switch or plugging relay driven by a V-belt from the head pulley serves two purposes: (1) To raise the pawl from the ratchet after the head pulley is in motion, and (2) provide a stop signal for the system, should mechanical or electrical failure occur.

Remote Control from Surface

A surface-control panel houses motor starting equipment, oil switch, protective 440-v. breakers, control relays, control transfer switches, and a full-wave copper oxide rectifier providing direct current for all remote control. Protective relays include reverse phase, undervoltage, short circuit, and torque control. The latter feature is

made possible by a CW power relay, so connected that the running power consumed by the 200-hp. drive motor cannot exceed full motor loading. When this occurs, the CW relay closes a contact which stops the feed underground and sounds an alarm. If the belt unloads sufficiently, the alarm will stop, permitting the operator to reclose the feeder circuit. Should the overload continue for more than 30 seconds, a TK-type timing relay started by the CW relay will energize the lockout contactor, thereby stopping the system and setting the belt overload light at the surface and underground. This feature of the control system is necessary to safeguard the main slope belt. The drive motor to head pulley speed ratio is about 36:1, with a consequent multiplication of torque. Assuming an overload, a wound rotor motor could apply 240% greater torque than normal, mechanically endangering the conveyor belt.

Transfer switches at the surface control station permit local control of the surface belts for unloading or maintenance, but do not allow operation of any underground equipment. This feature is necessary to give maintenance men an opportunity to spot the belts, and permit electricians to unload the slope belt, should it be stopped for any reason.

Delays Time Acceleration

Acceleration is by timed field delay relays, with current controlled by an SC over-current relay which would operate before the loaded belt reached full speed. Unloading is done manually by blocking the accelerating sequence at a point just moving the belt. Each foot of travel diminishes the load until more resistance can be removed from the rotor circuit. The grid bank in the rotor circuit must be of sufficient capacity to radiate the heat produced by this operation.

What Happens on Start-Up

To start up the mine conveyor system, all transfer switches are placed in remote operating positions. Power supply breakers are closed, and, prior to starting, the warning system energized. The system consists of a series of howlers placed at intervals throughout the length of the belts. The operator selects the system, either waste or ore, and pushes the selector button. For control description, it is assumed that the tripper and waste belt are installed and the operator has started the ore circuit.

The ore system is energized from the tripper to underground feeder through each belt in sequence. Considering the ore system then, the first unit set in motion is the tripper, push-button controlled from any one control station underground. Starting the tripper lights an indicator showing direction of travel, and upon reversing direction another light so notifies the operator. The ore system push button locks out all waste control in order to prevent contamination in the ore storage.

The surface belt, main slope conveyor, underground cross conveyor, and vibrating feeder are started in succession, each step visually reproduced on the control board by indicating lights. Ore is now being transported over the system from mine to surface storage and may be continued until the 1,000-ton storage pocket is emptied. When this point has been reached, the operator may dispose of waste by pressing the ore-release button and waste-system button in sequence. This locks out the ore system. However, a timing relay set to a predetermined value prevents further operation until all conveyors have had sufficient time to empty the ore carried into the ore bin. A by-pass button is provided so that this timing may be omitted should the operator know that all belts are empty.

The surface conveyor system is designed for two belts, with one already installed. A tripper will elevate the belt and dump ore in a storage pile to desired quantities. The tripper, operated by an electric motor, travels back and forth over the ore pile, being reversed by limit switches at the extremities of travel. The waste belt will operate below the surface belt at an angle designed to carry the waste to suitable disposition. To transfer waste from the surface belt to the waste belt, the tripper must be locked in the waste slot. This is done remotely by the underground operator. A thrustor-operated rail clamp grips the rail at any point at which the tripper is stopped, thereby preventing any creeping.

Switching from Ore to Waste

Returning to the description of waste handling underground, and assuming that the timing sequence operates, at the end of a known period the tripper will cease travel over the ore storage area on the surface and operate over the reversing limit switch to the waste slot. A limit switch will stop the tripper and notify the operator by setting a light on the control board. The waste belt may then be started, and in sequence the surface belt, main slope conveyor, underground cross conveyor, and waste feeder. Upon emptying the waste pocket the operator continues to the next level, repeating the operation just completed.

Vibrator Feeds Ore

The No. 1 underground station has two feeders, one belt and the other a vibrating type as previously mentioned. The belt feeds waste from the waste pocket to the cross conveyor, and the vibrator unit feeds ore in a similar manner. Since the material in either case flows by gravity through an adjustable aperture, the volume is readily controlled, permitting even slope belt loading. The cross conveyor unloads to slope belt No. 1, and in transit, ore and waste pass under a separating magnet for removal of tramp iron. The magnet is suspended from an I-beam and can be rolled away from the belt. When leaving the operating position a limit switch stops both feeder and cross conveyor so that the magnet can be moved to the iron dumping point. Here, another limit switch de-energizes the magnet with subsequent dropping of its load. When returned to operating position the feeder and cross conveyor are again energized.

Underground Control Center

The underground control center at station No. 1 contains control relays, line starters for local motors, and control push buttons, together with indicator lights for each motor and operation. Heater strips are provided to keep the enclosure dry, as the high humidity of the mine atmosphere quickly deteriorates organic materials susceptible to fungus and moisture. Control transfer switches at this point operate in a similar manner as those at the surface. Above the control station a small reversible belt receives ore or waste from the crusher, and according to direction, deposits either product in its proper storage pocket. Feed for the crusher is taken from 100-ton storage pockets just above the crusher room filled by ore trains operating on the 1,900 level. All power for control is fed from a mine substation, and includes three phase, 2,300-v. transmission for No. 2 slope belt, three phase, 440 v. for

local motors, crusher, and others, and 120-240-1 phase for lighting. Direct current for the magnet is provided by a full wave vacuum tube rectifier at 230 v.

Additional loading stations will approximate the initial installation and will be interlocked in order, with one station at any time in control. The present system is the result of several years' planning and investigation of a similar installation at Cominco's Sullivan mine at Kimberley, B.C., Canada, by members of the Pend Oreille staff. After establishing the basic design, control details were developed by electrical manufacturers coordinating electrical components with those of the belt and conveyor parts manufacturers. The system has proved economical as to manpower requirements and operation.

It has been found that interlocking against operational failures is necessary. The zero speed switch provides a simple means of stopping the system in the event of mechanical or electrical failure. The greatest damage can occur at any main slope transfer point, as material quickly fills the chute if not carried away and abrasion or cutting can destroy the belt. In the surface system where variable-speed drives feed the crusher belt, slipping has occurred at slow speed. Electrical translation of mechanical failure did not materialize. Again the zero speed switch on the tail pulley immediately detects mechanical failure. Because of torque control on the tension belts, loading at a consistent rate is important. Grid capacity in the rotor circuit of the main slope motors must be adequate for sustained operation at reduced speed.

Any purchase of a control system on this order should include a complete description of the sequence of operation. This omission has forced many unnecessary hours of investigation on the maintenance staff, and eliminated the average electrician as an aid in time of trouble. A descriptive outline such as this has little value in analyzing a circuit and should not be substituted by design engineers for descriptive sequence operation. Upon completion of this detail, satisfactory operation and less circuit tracing in electrical investigation is anticipated.

In conclusion, I wish to thank W. L. Zeigler, general manager, Pend Oreille Mines & Metals Co., for his permission to publish this article.

(Editor's Note: A previous article on Pend Oreille's contour mining system appeared in *E&MJ*, July 1949.)

Liquid Coating Extends Pump Life

RAYMOND J. MARCOTTE
Quality Control Manager
Calumet & Hecla Consolidated Copper Co.
Smelting & Refining Dept.
Hubbell, Mich.

DESIRING A LINING for pumps that were wearing out rapidly and required continuous maintenance, Calumet & Hecla Consolidated Copper Co. has made use of Neoprene in liquid form with marked success. For the trial, two pumps were selected. One was handling mill tailings; the other was a small mine pump. Both of the pumps were severely cavitated.

The materials used were supplied by Gates Engineering Co., New Castle, Del., which manufactures the liquids from crude material made by DuPont.

To evaluate abrasion resistance of the lining, the shell of the tailings pump, which had some cavitation more than ½ in. deep, was sandblasted clean and the cavitations were filled with Neoprene putty or troweling compound. The whole was then given six successive brush coats of Neoprene until there was a uniform coat about 0.06 in. thick above the high metal spots. The entire assembly was then cured.

Because of the excessive thickness of the coating in the cavitations, severe blistering resulted during the curing. The non-cavitated areas did not blister. The blisters were repaired and the pump was put back in service. It is still operating after a year of service. There has been no maintenance expense (surface conditioning) during that time. The lining has worn off of the high spots, exposing the metal. In the cavitations, where it is still intact, we are now experiencing uniform wear of exposed metal and Neoprene so that the surface remains smooth.

Prior to applying the lining, a monthly inspection and costly filling of cavities by welding had been necessary. The pump appears to have good service remaining. This is remarkable when one considers that the shell had been ready to be discarded.

Corrosion Resistance Determined

The cast-iron pump had been selected to evaluate the corrosion resistance of Neoprene to our mine waters. We chose one which had become badly graphitized to ⅛ in. depth from corrosion in less than a month and was to be scrapped. It was sandblasted free of graphite and given a Neoprene lining (about 0.06 in.) and returned to the same mine station where it had been. This was on the 43d level of Kearsarge No. 1, about 4,500 ft. down vertically. The pump has now been in continuous service since Feb. 13, 1952. Actual running time is not known, the pump being controlled automatically, ready to operate as needed.

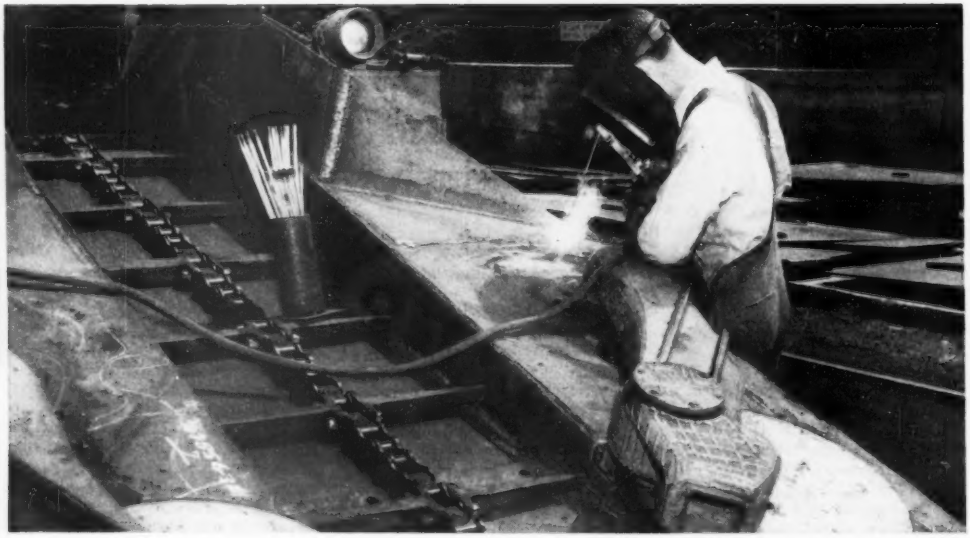
We finally brought the pump to surface on Feb. 22 this year, after 53 weeks of continuous operation. The surface seems practically unaffected. A short length of 4-in. pipe (which was also coated with Neoprene and placed in the pump line) is in excellent condition and shows no evidence of tuberculation or building up of scale. Here, also, the casing had been one which was to be discarded because of excessive graphitization. The pump has been reassembled and put back in service. The mine staff is enthusiastic over this performance.

The volume of water which this pump is handling varies with the seasons and the volume of current surface water. The concentration of salts will range from about 0.3% during the spring thaw to about 4.5% during the winter. At the time the pump failed, the concentration was approximately 1.5%. It is our opinion that the 1.5%± concentration resulting from mixing current aerated water with the deep water represents the more corrosive condition.

More recently, the Gates company has developed liquid Neoprenes which are air-curing. They think these materials will prove effective on pumps that are not so severely worn. At our first opportunity we plan to evaluate these modifications of the material.

CHANGING UNIT ASSEMBLY. William McKenny (left) and Thomas Hill, mechanics, change unit assembly, including traction motor and speed reducer, on shuttle car in underground sectional shop. Motor will go to surface.

Efficiency of Trackless Mining



HARD SURFACING. Gathering arms of loader are being hard-surfaced by electric welding. This is done each weekend.

LUBRICATION OF LOADER. Joe Armstrong (left), shuttle car operator, lubricates rollers of crawler frame of loader, while Hugh Perryman, loader operator helper, pumps portable pressure. This is done every shift.

Depends on Maintenance

SCHEDULED MAINTENANCE of mobile equipment is gaining importance at ore mines of the U. S. Steel Corp.'s Tennessee Coal & Iron Division at Birmingham, as the adoption of mechanical mining grows. The engineering and operating staffs have done much research on the equipment used to determine what maintenance procedure is best. A supervisor's handbook has been developed to assist in training crews and in standardizing the different maintenance operations. This study is continuing as modifications are made in equipment design. In this way the mechanical efficiency of equipment is maintained at a high level and down-time has been greatly reduced. Expenditures for maintenance have been repaid by the higher operating efficiency attained.

The adoption of mechanical mining has opened a new era at Birmingham. TCI's Ishkooda No. 11 mine, on Red Mountain, was the first iron mine in the world to use a mobile loader discharging into shuttle cars. The equipment was especially designed to handle the heavy abrasive ore.

Maintenance Program Set Up

TCI reached the conclusion early that efficiency of operation depended largely upon adequate maintenance so that equipment could be kept working continuously. The outcome was a program of standardized, preventive maintenance. At the start when the mobile equipment was new, it was impossible to observe a set maintenance schedule. However, this end has been attained with experience.

The loss of production due to mechanical failure was recognized early. As data accumulated on a unit's operating life, it has become possible to schedule replacements before the life of the machine has been used up.

Manufacturers have worked closely with TCI engineers and shop personnel in solving equipment problems. Designs have been altered to incorporate features developed in the shops. This has resulted in more efficient operation and made repairs easier, as where additional space or clearance has been allowed between chassis or assemblies.

TCI's maintenance program is divided into two parts: tasks done underground and those done in central shops provided above ground for all major overhaul and equipment repairs. Underground, the program covers inspection, lubrication, unit assembly changes and minor repairs. This consists of shift, daily and weekly performance varying in intensity with the time schedule.

The normal maintenance crew per shift per section consists of one electrical and one mechanical specialist responsible for daily inspection and maintenance, including adjustment. Synchronizing the operation of all equipment is considered highly important. This work is done mostly before the shift starts mining.

The preventive maintenance crew consists of two electrical and four mechanical specialists who do their

scheduled work during the weekend shutdown to avoid interrupting production.

Because of limited underground shop facilities most maintenance is confined to inspection, lubrication, minor repairs and unit replacements. All major overhauling is done in the main shops above ground.

Checking Precedes Use

Before the start of each shift, the maintenance crew checks all equipment thoroughly and makes any minor adjustments necessary. Lubrication is done by the unit operator while the checkup is in progress.

Hydraulic systems are checked daily and replaced when worn. Old cylinders are returned to the main shop on surface to be overhauled and rebuilt.

When found advantageous or necessary, unit assemblies are changed and some major repairs made. This is part of the preventive maintenance program designed to forestall possible machine failure and interruption to production.

The weekly inspection is made according to a prepared check list and is most complete. Operating experience has dictated the extent of actual and preventive maintenance necessary.

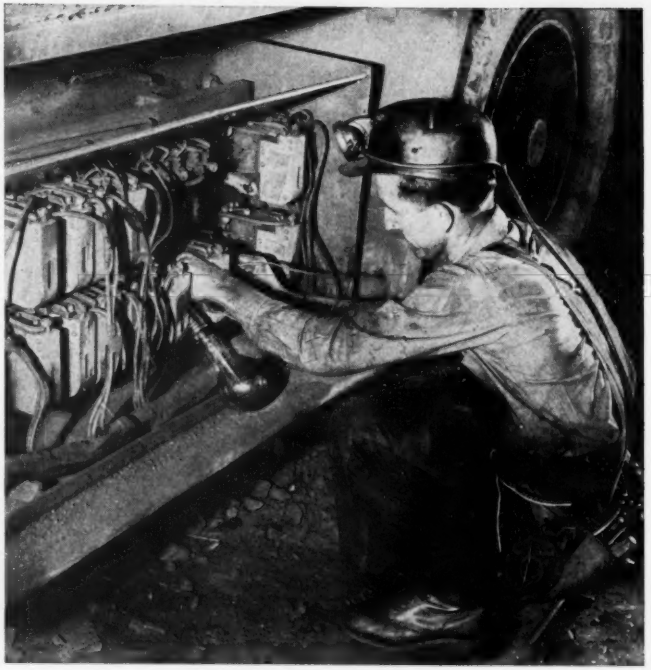
TCI experience has shown that it is advantageous to replace wear plates, gear boxes, the gathering arms, conveyor chains as needed, and to hard-surface parts where wear has been greatest.

Specifically the experience has been that it is economically advantageous to hard-surface the hinge point between loading head and conveyor, about 6 in. each way, with cross hatches to obtain a more even wearing surface. TCI does not hard-surface the steel plates on the loader because it makes for excessive wear of the chain. But gathering-arm brackets, gathering-head plates and saw-tooth bill are hard-surfaced.

Gathering arms are replaced weekly, sent to the central shop to be hard-surfaced.

Weekly Check Up for Motors

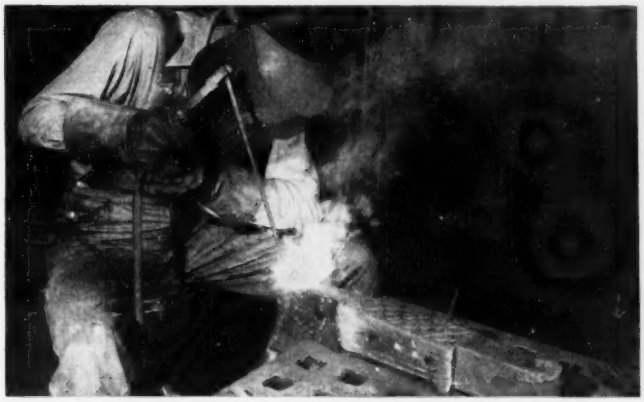
Electric motors are checked weekly and replaced as necessary. Motor bearings are lubricated once every three months. All motors are overhauled and rewound in the central shop. However, if a bad bearing develops on a motor, no effort is made to change it underground.



REWORKING CONTROL PANEL. Tom Hunter, electrician, is installing a time tactor in control panel for loader. Panel is being reworked on surface.

MOTOR OVERHAULED. Tom Hunter (left) and W. J. Davis, electricians, are installing armature in motor of loader as part of general overhaul on surface.

TESTING CONTROL PANEL. Earmon Davis, electrician, is testing control panel for shuttle car following minor repair made on car underground.



WELDING WEARING PLATE. An electric welder is shown welding a new wearing plate on the head of a loading machine.

The motor is changed and sent to the central shop for repair.

Experience has been that the front wheels on shuttle cars should not be lubricated each day, but cleaned and hand-packed once each six months. It was found that the lubricating crew was giving a shot of grease too often. This was excessive lubrication and, as a result, the grease was getting into the mechanism and causing brake trouble.

Shuttle cars with aircraft-type disc brakes, which are self-adjusting, are used on the rear wheels. Maintenance crews tend to overlook adjusting the front brakes, because it is unnecessary for the rear ones. However, the front brakes should be carefully inspected and adjusted at least once each week when making general inspection and doing major preventive maintenance.

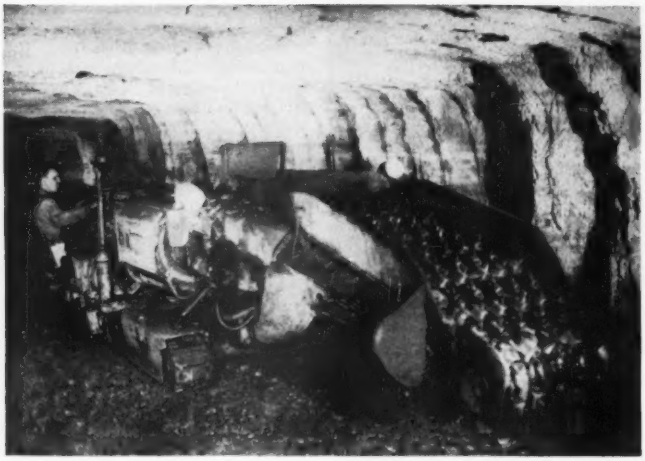
The electrical specialists in the maintenance crews check and adjust all such equipment and replace, if necessary, control panels, brushes, cables, contacts and connections. TCI uses 500 ft. of No. 0 cable on the loader and No. 2 cable on shuttle cars. Five temporary splices in the cable are allowed before it is replaced. The spliced cable is sent to the central shop where permanent repairs are made and splices are vulcanized. The cable is then returned to the underground section as a spare.

The company has 18 trackless loading units, including three spares, one each for Ishkooda, Muscoda and Wenonah; two shuttle cars for each loader in operation, plus two spares for each division, or a total of 36 shuttle cars.

Each group includes a trackless loader, two shuttle cars, two mobile drill jumbos, one roof-bolting machine, one elevator conveyor, where necessary, and one auxiliary hoist or locomotive for switching cars. There are 15 groups in operation.

The company operates electrical, mechanical, welding, and forging shops; also car and drill repair, carpenter and paint shops in the group within the central shop. The shop personnel totals about 100 employees. F. B. Culwell is superintendent of maintenance; W. A. Shrader, general maintenance supervisor underground; and W. W. Fowler, Jr., maintenance supervisor for the surface. Each division has a maintenance supervisor and assistants.

MAKING ADJUSTMENT ON LOADER. Earl Brasher, mechanic, is making an adjustment in chain on loader. All such adjustments and repairs are made underground.



NON-STOP MINING of potash is being tried in Carlsbad with continuous mining machine, shown here cutting coal. Cutting teeth on boom dig up into ore.

What's New in the Carlsbad District?

In Shaft Sinking:

1. Eight new shafts sunk.
2. Improved grouting and freezing techniques developed.
3. Magnesium forms speed up concreting.
4. Headframe moved to shaft after erecting.

In Mining Equipment:

1. Joy Continuous Miners improve productivity.
2. Diesel-driven D-4 bulldozers used underground.
3. Diesel-driven 15-ton trucks used underground.
4. Mobile rig speeds up drilling.
5. Blasting practice improved.

In Milling:

1. Dust collection improved.
2. Better centrifuge performance.
3. Instrumentation improves plant control.

More Potash From Carlsbad

Here's a brief account of the new enterprises and new methods that will add several hundred thousand tons to this mining district's annual capacity.

JOHN B. HUTTL,
Associate Editor

WITH TWO NEW COMPANIES in the field, and with all five companies trying out one new idea after another in a drive for maximum productivity, the Carlsbad potash area in New Mexico is one of the liveliest mining districts I've seen in years.

Duval Sulphur & Potash has already put in a new shaft and surface plant. Southwest Potash Co., an American Metal subsidiary, hopes to be in production by the middle of the year. The new plants these companies have built are showpieces, to say the least.

Shaft sinking in the district was handled largely by contracts with Utah Construction Co. and Winston Bros. All the shaft jobs ran into trouble, as expected, in the Culebra water-bearing zone, and several interesting grouting or freezing techniques were worked out to get the shafts past this point.

For a description of Duval's grouting technique, see *E&MJ* for May, 1952, p. 99. Duval saved six weeks in getting into production by building their permanent headframe off to one side of the temporary headframe used in sinking. When the shaft was ready, the headframe was simply skidded over into place. (See *E&MJ*, May, 1952, p. 78.)

District Is New

Spurred by potash shortages in World War I, the U. S. Government and private companies began intensive investigation in the 1920's of the potash-producing potential of the Permian salt beds of the Southwest. Discovery of a potash mineral in an oil well near Carlsbad led to prospect drilling in that area, and eventually to development of the rich sylvite beds now being mined.

U. S. Potash Co. in 1931 was the first to begin mining at Carlsbad. Potash Company of America started production in 1934, and International Minerals & Chemical Corp. in 1940. (For a complete description on the latter operation, see *E&MJ*, April, 1941.)

Duval Sulphur & Potash Co. began producing in early 1952, and Southwest Potash hopes to be producing by the middle of the year. These two new producers should add about 250,000 and 185,000 tons of 60% K_2O respectively to the annual production of the Carlsbad district, which runs around 5 million tons annually of combined sylvite and langbeinite.

Foremost after the new plant construction mentioned are the many new shafts sunk in the district during the past two years. Of particular interest is the grouting done in several shafts to seal off the Culebra water zone ahead of sinking. Potash Co. of America also had to freeze a large section of watery quicksand earth to a depth of 360 ft. preparatory to sinking their new ventilation shaft.

Grouting was done through diamond drill holes advanced from stations a short distance above the Culebra formation. Drilling shaft rounds followed more or less standard practice, and mucking of broken ground was done by Riddell shaft mucker units.

In the two circular shafts of Southwest Potash Co. the bridge holding the clamshell operating mechanism operated on a circular ring suspended from several cables and wedged tight against the shaft walls during mucking. It resembles somewhat the turntable arrangement used in locomotive roundhouses.

All shafts are concreted to the salt horizon, and at the Duval Sulphur property the forms used in this

work were made up of a number of panels made from magnesium with plyboard facing held together by prefabricated walers. Each 5-ft. form was erected and aligned in two hours by five men. Another innovation employed here to great advantage was a mechanical hitch cutter to cut hitches in the salt formation into which structural steel was subsequently grouted to support the shaft guides.

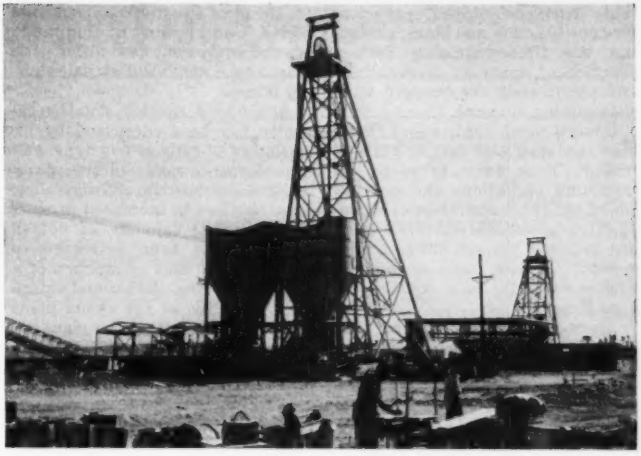
New Ideas Developed

While no great changes have been made in underground mining methods, several companies have developed new equipment units and innovations to speed production and provide greater safety. This also applies to the refineries. As known, potash is recovered in the refineries both by flotation in saturated brine and by crystallization. International Minerals, Potash Company of America, Duval, and Southwest Potash employ the flotation process and U. S. Potash the crystallization method. The flotation technique practiced at Potash Company of America differs from that at the other three refineries in that salt is floated off and the potash depressed.

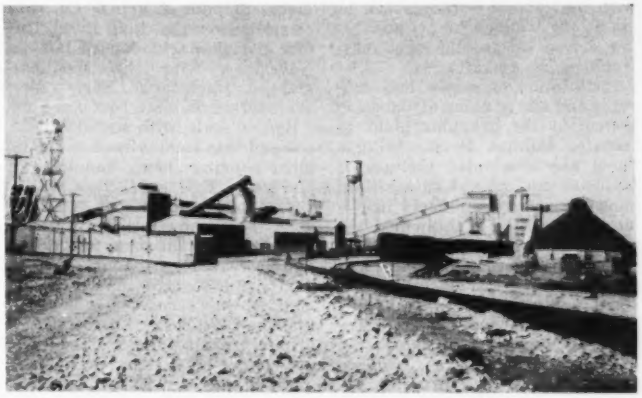
International Minerals is steadily increasing production of sylvite and langbeinite ores and K_2O. The No. 3 and No. 4 shafts have been completed, and lateral development is being advanced. Improvements made underground include installation of 75-lb. rails on the main haulage lines; a second diesel bulldozer; car spotting hoists at the loading heads; and rubber-tired drill jumbos. Two drillers operating one of the jumbos can drill as many holes as five drillers can drill with conventional post-mounted drills.

Blasting has been improved by use of a lightweight blasting box attached to a shuttle car for transfer from face to face. It consists of a condenser energized by two dry cell batteries, and is a marked improvement over the blasting reel method formerly used. Adoption of an improved drill round has resulted in better ore breakage, which in turn increased efficiency of the loading machine and decreased maintenance.

At the IM&C refinery modifications to centrifuges have resulted in drier cakes; revamping burners and furnace fire boxes brought about increased drier efficiency and decreased gas consumption; and overall plant efficiency has been increased by wider application of instruments for process control. To reduce corrosion, rubber pilot pipe and rubber-lined steel pipe and steel are used wherever possible. At the chemical plant addition of a unit designed to treat reject liquors from the potassium-sulphate plant for recovery of magnesium values is planned. Products to be made are periclase and hydrochloric acid.



ONE NEW MINE in Carlsbad district is Southwest Potash Co., American Metal subsidiary. Two shafts shown here should soon be in production.



OTHER NEW MINE is opened by Duval Sulphur & Potash Co. Note fine construction of buildings, including refinery, left, and storage, right.

U. S. Potash Co.'s No. 2 shaft, used for auxiliary hoisting and servicing the mine, has been equipped with a 90-ft. steel headframe and a 275-hp. Stearns-Roger double-drum hoist. Near the foot of the shaft a 150,000-cfm Jeffrey Aerodyne fan was installed to improve ventilation and make possible removal of surface air lock equipment formerly used in conjunction with surface fans. Underground the company has installed a Caterpillar D-4 diesel bulldozer for track fill and backfilling operations, and a diesel-powered trailer truck of local design and construction for use in development headings. This unit has a capacity of 15 tons and a gross vehicle weight of 55,000 lb. and will travel at speeds up to 18 mph.

The diameter of blastholes has been decreased to permit use of smaller dynamite cartridges, and these are drilled with hydraulically-operated, boom-mounted drills on rubber-tired carriages. Loaded holes are blasted with port-

table battery-equipped, capacitator-type blasting machines, obviating the time-consuming former practice of carrying power lines and shunt switches forward with each mining advance.

Underground locomotives have been equipped with carrier-current trolley phone units to speed up tramming operations and provide added safety. Installation of a new 12,470-v. power distribution system has reduced voltage drop underground. A new piece of mining equipment added is a Joy Continuous Miner.

About 6 mi. north of the U.S. mine a new 1,300-ft. shaft is being sunk as a preliminary to opening up this area for mining. The shaft measures 15 ft. in dia. inside the concrete lining and will serve as a combination supply and ventilation shaft. The water horizon will be pre-grouted from the surface by the Prepakt Co. Connection with the current workings will be via a long haulage tunnel now being driven toward the new shaft from the No. 1 shaft area.

Installation of a new belt conveyor and slurry pump distribution system at the granular plant to transfer tailings to the tailings dump has eliminated the use of bulldozer equipment and auxiliary hand labor. At the refinery installation of additional equipment has improved recoveries and increased production. More bagging and material-handling machinery for finished products is now available, and a Rotoclone wet dust-collector installed in the finished product handling department has reduced dust hazard to a minimum. Charging the ion exchange water softeners with one of the new plastic type synthetic softening agents resulted in greater efficiency and smoother operation.

In the city of Carlsbad U. S. Potash has completed a new general office, and industrial radio phones have been put in service with fixed stations at Carlsbad, mines, and refinery. These together with mobile units installed on a number of company vehicles and tramroad equipment are used for dispatching and emergency communications.

Potash Company of America has placed in operation two Joy continuous mining machines in development headings with good result. Two more units have been ordered. The new South shaft requiring freezing of a block of watery quicksand earth to a depth of 360 ft. ahead of sinking has been completed. Underground mining methods and equipment used differ little from those employed at neighboring mines.

At the PCA refinery, flotation capacity has been increased by installation of cells of new type, and improvements made in the chemical grade potassium chloride plant have resulted in increased production. Storage capacity of potash products has been increased to about 125,000 tons by erection of a fifth warehouse. Additional equipment installed at the steam plant and diesel-electric power plant include a 250-hp. Wickens automatic boiler and a 3,200-hp. Nordberg diesel engine.

Duval Producing Seven Months

Construction of the mine surface plant, crushing plant, refinery, storage building at the property of **Duval Sulphur & Potash Co.** was completed in the fall, 1951. The first potash was produced late in November, with the first car shipped December 5. Early refinery operations were conducted on a limited scale, with stored sylvite ore and that coming from development headings being handled exclusively. Full production is expected to be reached soon after the steel headframe erected during sinking operations at a temporary site has been moved over No. 1 shaft and storage bin attached. This job was scheduled to be completed on February 12, 1952. The different plant units are veritable showpieces—the latest in modern plant design — with ample space available to accommodate extra equipment in the event an increase in plant capacity is desired at some future date. Flowsheets and general metallurgical practice follow closely those found in other refineries in the district employing the flotation process.

Ore production is hoisted through No. 1 shaft some 300 ft. distant from No. 2 shaft which is used for handling men and supplies and for ventilation. Both shafts contain three compartments and are concrete lined to the 825-ft. horizon. Depths are 1,558 ft. and 1,463 ft. respectively. The Culebra water zone occurring at 640 ft. was grouted from stations cut in the two shafts at the 580-ft. point, and about 20,000 sacks of cement were used in this work. The two shafts are connected by a drift through the intervening salt at a depth of 870 ft. Water made in the shafts is collected in a sump installed in the drift, whence it is pumped to the surface by a pumping plant available near shaft No. 2. Mine development, mining methods, equipment used, follow standards established in the area.

Southwest Potash Co. is completing construction of a mine surface plant, crushing plant, refinery, and storage building capable of handling about 2,500 tons of sylvite ore a day. The mine is being opened by two circular shafts: the No. 1, 15 ft. in dia. inside the concrete lining; and No. 2, used for ventilation and servicing underground operation 22 ft. in dia. Then, as at Duval Sulphur property, both shafts are connected by a drift about 400 ft. long driven on the 500-ft. horizon containing two concrete-lined sumps and pumping station to handle water made in the shafts. Concrete lining extends to 472 ft.

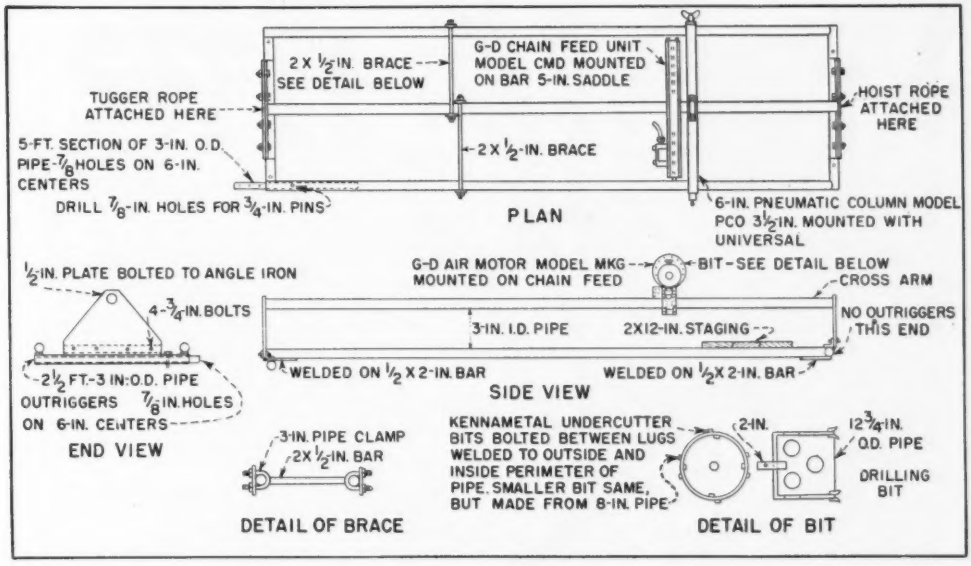
No. 1 shaft contains two hoisting compartments, manway, and a utility compartment formed by special steel dividers. The steel headframe is 135 ft. high and the 10-ton skips to be used will be operated by a 500-hp. double-drum hoist.

No. 2 shaft is divided into two equal sections by a concrete curtain wall extending from the collar of the shaft down to the sump. One section is connected to a large fan on the surface, and the other section is divided by structural steel forms into two cage compartments, manway, and utility compartment. Shaft equipment includes a 90-ft. steel headframe and a 450-hp. double-drum hoist. Primary crushing will be done underground.

Treatment received by the mined sylvite ore will include secondary crushing in impact type crusher; scrubbing; classification; grinding in a rod mill; rougher flotation; cleaner flotation; centrifuging; and drying. Brine will be recovered in a multiple thickener plant.

Freeport Sulphur Co. is continuing exploration of areas in Eddy and Lea Counties started in 1949, with nine wells completed in 1951. This work has disclosed existence of an extensive potash bed in Lea County, with a small extension in Eddy County, and additional drilling is scheduled to be undertaken this year in the area to determine the ore outline. Metallurgical test work with a view to finding an efficient method of treatment for the type of ore found in the deposit is planned.

OPERATING IDEAS


2 X ½ IN. BRACE SEE DETAIL BELOW
G-D CHAIN FEED UNIT MODEL CMD MOUNTED ON BAR 5-IN. SADDLE
TUGGER ROPE ATTACHED HERE
HOIST ROPE ATTACHED HERE
5-FT. SECTION OF 3-IN. O.D. PIPE-⅞ HOLES ON 6-IN. CENTERS
2 X ½-IN. BRACE
DRILL ⅞-IN. HOLES FOR ¾-IN. PINS
PLAN
6-IN. PNEUMATIC COLUMN MODEL PCO 3½ IN. MOUNTED WITH UNIVERSAL
½ IN. PLATE BOLTED TO ANGLE IRON
G-D AIR MOTOR MODEL MKG MOUNTED ON CHAIN FEED
BIT-SEE DETAIL BELOW
CROSS ARM
4-¾ IN. BOLTS
3-IN. I.D. PIPE
2X12-IN. STAGING
NO OUTRIGGERS THIS END
2½ FT.-3 IN. O.D. PIPE OUTRIGGERS ⅞ IN. HOLES ON 6-IN. CENTERS
WELDED ON ½ X 2-IN. BAR
WELDED ON ½ X 2-IN. BAR
SIDE VIEW
END VIEW
3-IN. PIPE CLAMP
2X ½ IN. BAR
KENNAMETAL UNDERCUTTER BITS BOLTED BETWEEN LUGS WELDED TO OUTSIDE AND INSIDE PERIMETER OF PIPE. SMALLER BIT SAME, BUT MADE FROM 8-IN. PIPE
2-IN.
12¾ IN. O.D. PIPE
DRILLING BIT
DETAIL OF BRACE
DETAIL OF BIT

Special Drill Rig Speeds Hitch Cutting in Shafts

THIS DRILLING PLATFORM and drill cut time to one-sixth on a big hitch-cutting job at Duval Sulphur & Potash Co.'s No. 1 and 2 shafts.

The shafts were concrete lined to 825 ft., just below the salt formation. From there to the bottom, about 1,558 ft., shaft guides were to be attached to structural steel grouted into hitches cut in the salt walls.

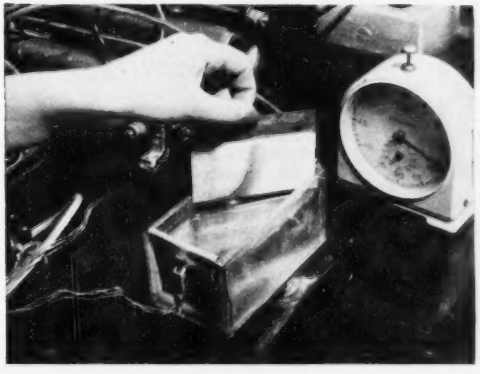
At least six hitches had to be cut for every 5 ft. of shaft. With usual chipping machines and light sinkers, workmen would have cut one hitch every hour.

So J. E. Tong, mine superintendent, R. N. Robbins, shaft foreman, and Gardner Denver Co. designed this special platform and drill. Result: Workmen cut each hitch, 14½-in. in diameter by 24-in. deep, in about 10 minutes.

Stability of the platform was provided by attaching the hoisting rope to one end of the platform, and by running a cable from a tugger hoist to the other end. It was also provided by four telescopic outriggers which engaged the walls on the end suspended from the tugger hoist rope. The air column provided additional stability and took thrust from the big rotary drill.

The platform was floored with 2x12-in. boards.

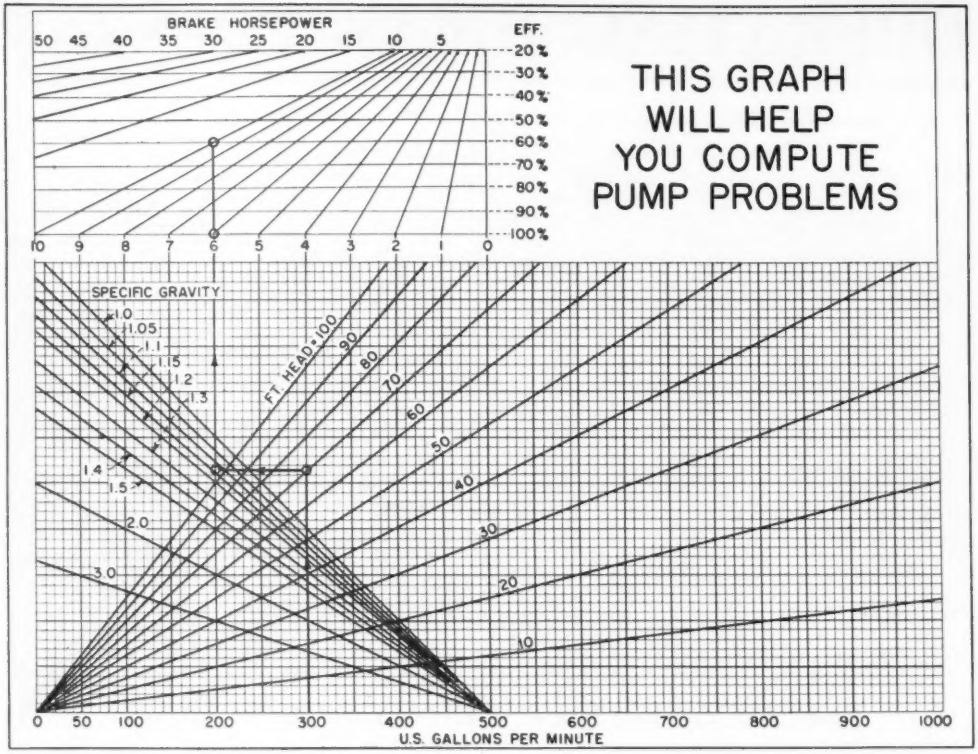
To position the drill, workmen slid it along the cross arm.



Cell Simplifies Electrolytic Tests

THE HULL CELL, by reason of a slant-installed cathode, allows for a great variation in current density during a single test. It is used for tin electroplating experiments by the Tin Research Institute, Fraser Road, Greenford, Middlesex, Eng., an international organization which studies and improves the methods of using and producing tin.

NOTE THE DIFFERENCE in tin deposited on left and the lighter coat on right, further away from anode.



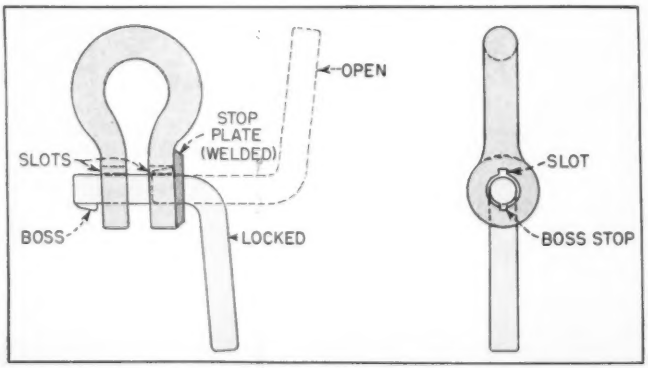
OUR FRIEND, Christian W. Matthews, Denver, Colo., has submitted the above chart for calculating the typical problems faced by mine, mill and smelter engineers. It makes easy work of the following equation:

$$\text{HP.} = \frac{\text{GPM} \times 8.33 \times \text{ft. head} \times \text{spec. gravity}}{33{,}000 \times \text{efficiency}}$$

Example: A pump is delivering 300 gpm of 1.15-gravity pulp through 70 ft. of head. The pump is 60% efficient. Find brake horsepower which must be supplied to the pump for these operating conditions.

Solution: Follow heavy "example" line from 300 gpm (bottom) up to 70-ft. head line. Then go horizontally (or right if gravity line is on right) to the intersection with specific-gravity line. Next go vertically to intersection with 60%-efficiency line (top left) and read the horsepower directly. Output of pump (6 hp.) is given on the 100%-efficiency line; input (10 hp.) is given on true-efficiency line.

Note: If GPM is 10 times as great, calculate for one-tenth that GPM and then multiply HP. by 10 to get answer. That is also true for foot of head.



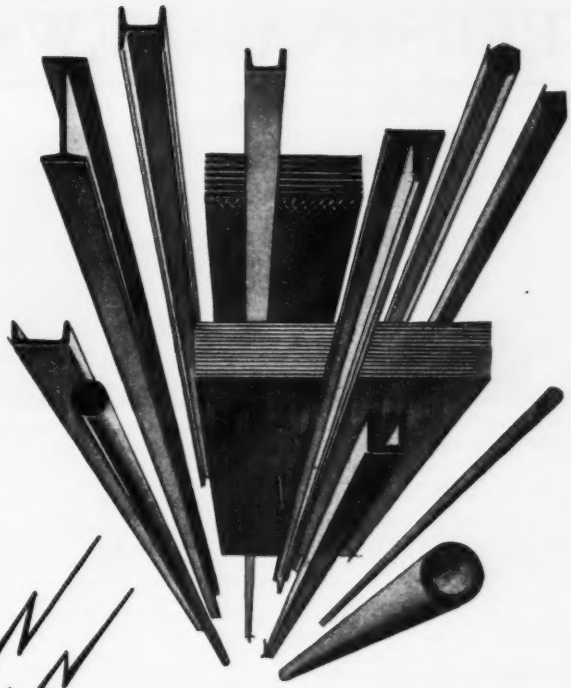
Clevis Locks by Gravity

WHERE SPEED is essential in disconnecting a bucket or skip from the end of a hoisting cable, this clevis may be the answer.

It has only three parts, each of which can be made in a simple shop. It has no delicate parts—such as cotter keys, lock nuts—which can break or get lost.

It was designed by Mr. Earl Stewart, blacksmith shop foreman, Chief Consolidated Mining Co., Eureka, Utah.

STEEL
for the MINING INDUSTRY



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PERSONAL NEWS

H. D. TIETZ (left) has been appointed manager of the Nickel Alloys Department. RANSOM COOPER, JR. has been appointed manager of the Nickel Sales Department of The International Nickel Co., Inc., New York, N. Y.

M. B. Scott, chief chemist for Hollinger Consolidated Gold Mines, Ltd., Timmins, Ont., has retired after 37 years' service.

H. A. Gardner was elected chairman of the board of Lyon Metal Products, Inc., Aurora, Ill., succeeding the late **Earl D. Power. H. B. Spackman** was elected chief executive officer, **J. M. Olesen** was elected a vice president and **H. F. Sadler**, a director.

Philip T. Kelly of Smooth Rock Falls, Northern Ontario, has been named to succeed **Welland S. Gemmell** as Ontario minister of mines. Mr. Gemmell is now minister of the Lands and Forests Department.

J. S. McDiarmid has completed a record of 20 years as minister of mines and natural resources for the Province of Manitoba.

John H. Ffolliott is now vice president and a director of Miami Copper Co. with offices in New York. Mr. Ffolliott came to New York several years ago from Tennessee Copper Co., a Miami affiliate.

Howard L. Waldron, formerly associate editor of *E&MJ*, is now district manager in New York for *Mining World*.

James Douglas, formerly assistant deputy administrator, DMPA, Washington, D. C., is now deputy regional director for Region 3 (headquarters in London, Eng.). **Tom Lyons**, acting assistant deputy administrator, will continue as director of the Domestic Expansion Division. **Julian Feiss**, executive assistant to the deputy administrator, has resigned to join Kennecott Copper Corp. in New York, N. Y., as staff geologist in the exploration department.

John C. Kinnear, Sr., assistant to the director of the Office of Defense Mobilization for metals and minerals, has been appointed U. S. representative on the Copper-Zinc-Lead Committee of the International Materials Conference. Mr. Kinnear succeeds **David T. Marvel**, retired deputy assistant adminstrator of the National Production Authority's Metals and Minerals Bureau. Mr. Marvel has returned to private industry.

F. J. Perry, in charge of exploration drilling for the Oliver Iron Mining Division, Duluth, Minn., has been appointed supervisor of ore movement. Mr. Perry succeeds **Samuel Naismith**, who has been transferred to Pittsburgh. Succeeding Mr. Perry is James S. Steel.

Robert D. Lindberg, mining captain at the Geneva mine, Ironwood, Mich., has been appointed assistant superintendent of the Oliver Iron Mining Division, Gogebic Range operations.

William Knudsen, Ishpeming, has joined the research staff at Jones & Laughlin Ore Co.'s ore research laboratory at Negaunee, Mich.

R. B. Caples was re-elected president of the American Zinc Institute for a second term. Mr. Caples is manager of the Great Falls Reduction Department of Anaconda Copper Mining Co., Great Falls, Mont.

Dr. Eugene S. Perry, of the faculty of the Montana School of Mines and the Montana Bureau of Mines and Geology, was elected president of the Rocky Mountain Section of the Geological Society of America. **L. S. Gardner** of Billings was elected vice president and **C. E. Erdman** of the USGS, Great Falls, Mont., secretary-treasurer.

William Ford, chemist at the Clifton mine, Degrasse, N. Y., has been transferred to Iron River, Mich., as assistant chief chemist for M. A. Hanna Co.

Jacob Gair, geologist, formerly on the University of Oregon staff, has joined the U. S. Geological Survey and is now on the Menominee Range.

K. D. Loughridge, formerly with American Smelting and Refining Co. at Selby, Calif., is now assistant superintendent of Asarco's Arkansas Valley plant at Leadville, Colo.

At M. A. Hanna Co. on the Mesabi Range, Minn., **Clayton Workman** and **William Laine** were made pit foremen at the Morton mine; **Elmer Kniffen** and **Angelo Beasy**, pit foremen at the Mississippi group; and **Joe Kempa**, shop foreman at the new Enterprise mine.

J. F. Bufalino, of Huse-Liberty Mica Co., Boston, Mass., has been elected president of the Mica Fabricators Association, succeeding **M. A. Chapman** of Schenectady, N. Y. **Franklin C. Farnman**, Asheville, N. C., and **J. W. Canter**, Rochelle Park, N. J., were elected vice presidents.

Evan Just, vice president of Cyprus Mines Corp. and formerly editor of *E&MJ*, has established offices for the company at 161 E. 42d St., New York.

R. A. Macdonald has been appointed chief geologist of Labrador Mining & Exploration Co., Montreal, Que.

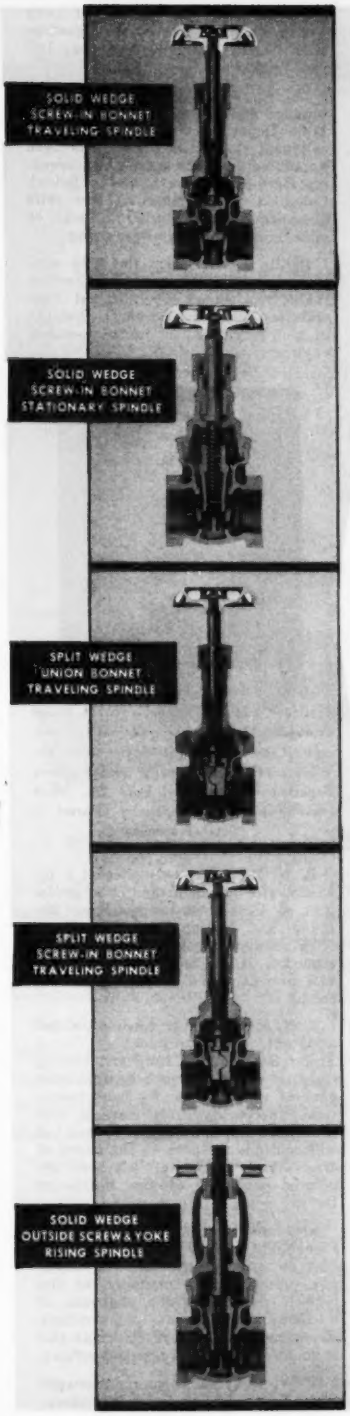
Louis Ware, Chicago, Ill., president of International Minerals & Chemical Corp., received a D.Sc. degree from the University of Kentucky.

Norwood B. Melcher, mineral economist and commodity specialist with the Bureau of Mines, has been appointed chief of the Ferrous Metals and Alloys Branch succeeding **Robert H. Ridgway**, resigned.

Walter S. Tower, retired president of the American Iron and Steel Institute, has been awarded the Gary Memorial Medal for outstanding service in the industry.

Robert E. Dwyer, executive vice president since 1940, has been elected president of Anaconda Copper Mining Co. and its subsidiaries, Chile Copper Co., Chile Exploration Co., and Andes Copper Mining Co. Mr. Dwyer succeeds **William H. Hoover**, who died in Butte, Mont., on June 6. **Clyde E. Weed**, formerly vice president in charge of mining operations, has become vice president in charge of operations and vice president of the above-named subsidiaries. **Edward S. McGlone** has been elected executive vice president, succeeded by **Chester H. Steel**, former general manager of western operations, as vice president in charge of western mining operations.

Laurence T. Eck has been appointed plant manager of the cobalt metal



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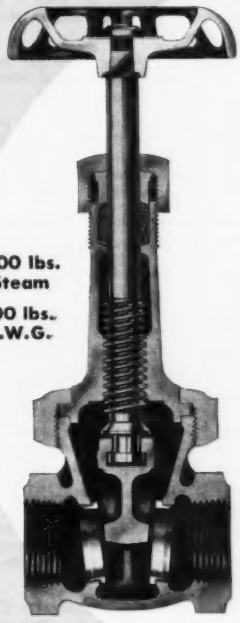

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refinery now under construction on National Lead Co.'s property at Fredericktown, Mo. **G. Edward Peters** has been named plant superintendent.

Niles C. Bartholomew, formerly assistant director of manufacturing of the Carborundum Co., Niagara Falls, N. Y., has been named vice president in charge of operations and organization for the company's subsidiary, Carborundum Metal Co.

C. D. Clarke, formerly superintendent of the Yauricocha mine of Cerro de Pasco Corp., Peru, has been transferred to Cerro de Pasco as superintendent.

E. M. KLINE has been made general manager of the Huntington (West Virginia) Works of The International Nickel Co., Inc. Mr. Kline succeeds HERMAN M. BROWN, who has retired as general manager but will be available on a consulting basis. G. K. CROSBY has been appointed assistant general manager.

P. J. Shenon and **R. P. Full** have reopened their consulting firm headquartered at 1339 Third Ave, Salt Lake City 3, Utah. **Richard P. Gerwels**, former chief engineer for the Bayard Department of U. S. Smelting, Refining and Mining Co., has joined them.

Dr. William D. Coolidge, Schenectady, N. Y., former vice president and director of research for the General Electric Co., will be the first recipient of the K. C. Li prize and award from Columbia University for his pioneer work on tungsten.

Ward Carithers, Prescott, Ariz., has left his position as geologist with Calera Mining Co., Cobalt, Idaho.

H. Rush Spedden has left the Massachusetts Institute of Technology in Cambridge to join Union Carbide & Carbon Research Labs, Inc. at Niagara Falls, N. Y. as research mineral engineer.

S. E. Hollister, with Southwestern Engineering Co., Los Angeles, Calif. has been granted a leave of absence to go to Japan as mining and metallurgical consultant to **Clyde Bruce Aitchison**, Jr. Mr. Hollister may be addressed at Central Post Office, Box 106, Tokyo.

Harold A. Krueger, formerly production manager, has been appointed manager of the St. Louis, Mo., Smelting and Refining Division of National Lead Co.

Dr. Gilbert E. Doan, head of Lehigh University's Department of Metallurgy since 1939, will become manager of the metallurgical branch of Koppers Co., Inc. Research Department.

A. B. Parsons has resigned as director of the Program Development Division of the Defense Materials Procurement Agency to return to his Oakland, Calif. home after 18 months with DMPA and DMA. He will continue as consultant to DMPA with headquarters at U.S. Customs House, San Francisco.

Howard M. Fowler, mining engineer, has joined Climax Molybdenum Co. at Climax, Colo.

H. B. Ewoldt, assistant to the president, Copper Range Co., has been transferred from Boston to the Chicago, Ill. office, where the White Pine project design work is in process.

Leo Borasio with the design group of Stearns-Roger Mfg. C., Denver, Colo., will be temporarily located at Virginia, Minn., working on Oliver Iron Mining Co.'s new taconite plant.

Jack V. Hill is now mineral testing engineer with Western Machinery Co. in charge of their laboratory at San Francisco, Calif.

Glen E. Fassler has rejoined the New York & Honduras Rosario Mining Co., Tegucigalpa, Honduras, as assistant to **K. H. Matheson**, head of the company's exploration program.

I. V. Korts, Marquette, Mich., is manager for O. W. Walvoord Co. of Denver, Colo., which holds the contract for the design and construction of the flotation mill for the Humboldt Mining Co.

William F. Keyes is now with E. I. DuPont de Nemours & Co., Wilmington, Del., as ore dressing consultant in the engineering department.

R. L. Carmichael has joined Battelle Memorial Institute in Columbus, Ohio, as a research engineer.

Lucien Eaton, Jr. has been transferred to the Chicago, Ill. office of the Western Knapp Engineering Co., now on the White Pine project.

A. W. Jeffers has been transferred from Stamford, Conn to Phoenix, Ariz. as field engineer for American Cyanamid Co.

Howard G. Schoenike has resigned as geologist for M. A. Hanna Co., Cleveland, Ohio to join the Baroid Sales Division of National Lead Co., Houston, Tex.

J. P. Brown has been promoted from mine engineer to mine foreman at New Mexico Consolidated Mining Co., Hanover, N. M.

J. E. Moore, formerly field engineer with National Lead Co., has retired in San Leandro, Calif.

P. W. Holzgraf, engineer of Long Beach, Calif., has accepted a position with Thomas B. Bourne Assoc., Inc. in Japan.

D. W. Bent, former mine maintenance and servicing captain in the Mine Department of Hollinger Consolidated Gold Mines, Ltd., has been appointed production captain succeeding **Herb Shuttleworth**, now in British Columbia. **T. H. Jones**, former shift boss, has been appointed foreman of mine maintenance and servicing.

Phillip E. McGarry, formerly with Idaho Custer Mines, Inc., Clayton, Idaho, has joined International Minerals & Chemicals, Research Division in Mulberry, Fla., as junior research engineer.

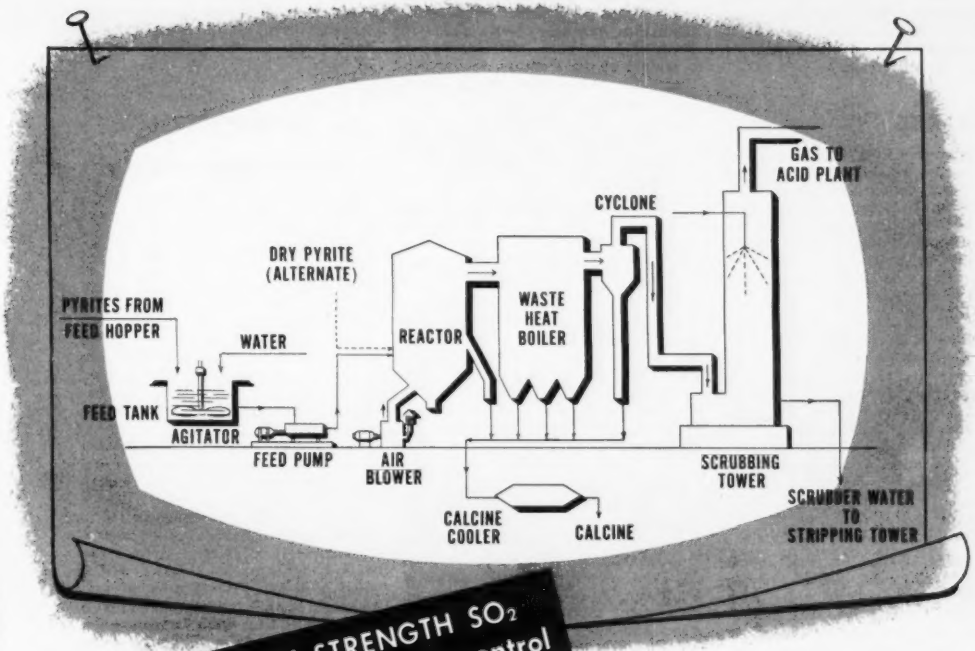
GLOYD M. WILES has been named vice president and general manager of Nickel Processing Corp. and will be resident manager of the operation at Nicaro, Cuba. Mr. Wiles continues as manager of the mining department of National Lead Co., which recently acquired a majority interest in Nickel Processing.

R. N. Hunt has been elected a director, vice president and chief geologist of United States Smelting Refining and Mining Co., New York, N. Y., succeeding **O. J. Egleston**, resigned. **G. H. LeFevre** has been elected vice president and manager of metal sales.

J. B. Metcalfe has been appointed assistant to the president of United States Smelting Refining and Mining Co. **J. D. Crawford** has been appointed general manager of Alaskan operations, succeeding **R. B. Earling**, vice president. Mr. Earling has retired but will continue to serve on the board of directors. **J. C. Boswell** has been appointed manager of the Fairbanks Dept.

Alexander C. Brown, president of Cleveland-Cliffs Iron Co., Cleveland, Ohio, is assuming the duties of executive officer of the company, at the request of **E. B. Greene**, chairman of the board. Mr. Greene will continue to perform the duties of chairman and to act as counsellor in company affairs.

M. W. Rushton, formerly manager of the South African Land & Explora-



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tion Co., Ltd., is now manager of the Welkom Gold Mining Co., Ltd., controlled by Anglo American Corp., in the Orange Free State Goldfields, Union of South Africa.

OBITUARIES

Joseph Henry Rodgers, one of Colorado's leading mining geologists, died in Boulder, Colo. on April 23. A graduate of the University of Wisconsin and Northwestern University, Mr. Rodgers was responsible for early development in British Columbia and active in Colorado since 1922. He was one of the owners of the Slide mine at Gold Hill.

Arlington E. Stanton, St. Louis, Mo., vice president of American Zinc Lead & Smelting Co., passed away on June 10. Connected with the industry for 46 years, Mr. Stanton was employed by Lanyon Zinc Co., Caney, Kan., as a bookkeeper-auditor; he joined American Zinc upon its acquisition of Lanyon Zinc. Serving at company properties in Kansas until 1911, he transferred to St. Louis as auditor, becoming vice president in 1941.

C. B. Van Deman, 82, well known Colorado mining man, died recently at Manitou Springs, Colo. Mr. Van Deman has been identified with numerous lead and zinc mining operations in San Juan County, southwestern Colorado. Prominent in the organization operating the Lark mine at Silverton, he operated the Isabella mine in Cripple Creek until the government closed gold mines.

Firmin Vincent Desloge, 73, died May 18 at Santa Barbara, Calif. A graduate of St. Louis College and Massachusetts Institute of Technology, Mr. Desloge was president of Desloge Consolidated Lead Co. until its merger with St. Joseph Lead Co. and Smokey Oil Co. The Firmin Desloge Hospital, provided for in the will of senior Desloge, stands as a monument to the family name in St. Louis, Mo.

John Lester Perry, president successively of United States Steel's Tennessee Coal, Iron and Railroad Co., Carnegie-Illinois Steel Corp., and Columbia Steel Co., died May 27 in Pittsburgh, Pa. Mr. Perry, 71, retired in 1948 after 49 years in the steel business, rising from a clerk with American Steel & Wire Co., Worcester, Mass., in 1899.

William H. Hoover, 63, passed away in Butte, Mont., on June 6. Educated at Wooster and Harvard Universities and holding an honorary LL.D. from the Montana School of Mines, Mr. Hoover joined Anaconda Copper Mining Co. in 1914, the same year he was admitted to the Montana Bar. Elected president of Anaconda in 1949, he was president and director of Andes Copper Mining Co., Basic Magnesium, Inc., Butte Water Co., Chile Copper Co., and Chile Exploration Co. In addition, he was an officer and director of Anaconda's subsidiaries and several other companies, including the National City Bank of New York. Mr. Hoover was president of the Montana Chamber of Commerce and trustee of the Roosevelt Hospital, New York.

Frank C. Winner, head of the engineering and research department of Magnolia Metal Co., Elizabeth, N. J., died May 20.

Charles E. Greenough, New York, N. Y., died on May 12 at 72. Mr. Greenough, a graduate of Yale and Columbia, was the former treasurer of Grand Union Mining Co.

John Carroll Nicholls, 73, former assistant to the president of the International Nickel Co. of Canada, died on May 29 in Toronto. A graduate of the University of California, Mr. Nicholls worked first in Korea and then on the Transvaal, coming to Canada as engineer for Dome, South Porcupine. He came to Inco in 1912, serving until 1944.

Robert L. Hallett, consulting engineer and chief chemist for the National Lead Co. from 1938 to 1948, passed away May 17 at 70 in Brooklyn, N. Y. A former president of the Mining and Metallurgical Society of America, Mr. Hallett served as chairman of the tin subcommittee for the Army and Navy Munitions Board and was tin adviser to the Council of National Defense.

Charles K. King, chairman of the board of The Ohio Brass Co., Mansfield, Ohio, passed away May 31, at his summer home in Edgartown, Mass.

Charles C. Swift, 74, retired mining engineer of Los Angeles, Calif., died on April 11.

Walter Scott Reid, 70, graduate of Rolla School of Mines and 50 years a mine superintendent and operator, passed away recently in Knoxville, Iowa.

John S. Shaw, 67, former director of safety of Hercules Powder Co., died April 26 in Houston, Tex., after an illness of several months.

Walter Freshman, 56, Butte, Mont. exploratory geologist for the Anaconda Copper Mining Co. and for five terms a member of the Montana legislature, passed away April 2.

E. H. Lang, 85, former traffic manager for the Anaconda Copper Mining Co. in Montana and New York, died recently at Hollywood, Calif., his home since his 1940 retirement.

W. C. Lubrecht, 80, Bonner, Mont., retired general manager of the Anaconda Copper Mining Co.'s lumber department, died on April 21. Mr. Lubrecht had been with Anaconda since 1897.

Norman Gaynor construction subboss from 1917 to 1943 at Hollinger Consolidated Gold Mines Ltd., Timmins, Ont., passed away in April.

Hermon R. Fawcett, graduate of the University of Ottawa and retired mining engineer with the Pacific Marine Supply Co., died at 74 in Seattle, Wash.

APPRECIATION

Charles Henry White

On March 17 Charles Henry White, my esteemed friend for over 40 years, passed away in an Oakland, Calif. hospital following a cerebral hemorrhage. Although he had reached his 86th year, he was working on a manuscript on the genesis of ore deposits until shortly before his death.

Born in North Carolina on Aug. 13, 1865, Mr. White received his early education at Vanderbilt University and the University of North Carolina. In 1897 he obtained his S.B. (magna cum laude) from Harvard University and his A.M. in 1902. From 1905 to 1917 he was assistant professor and then professor in mining and metallurgy at Harvard.

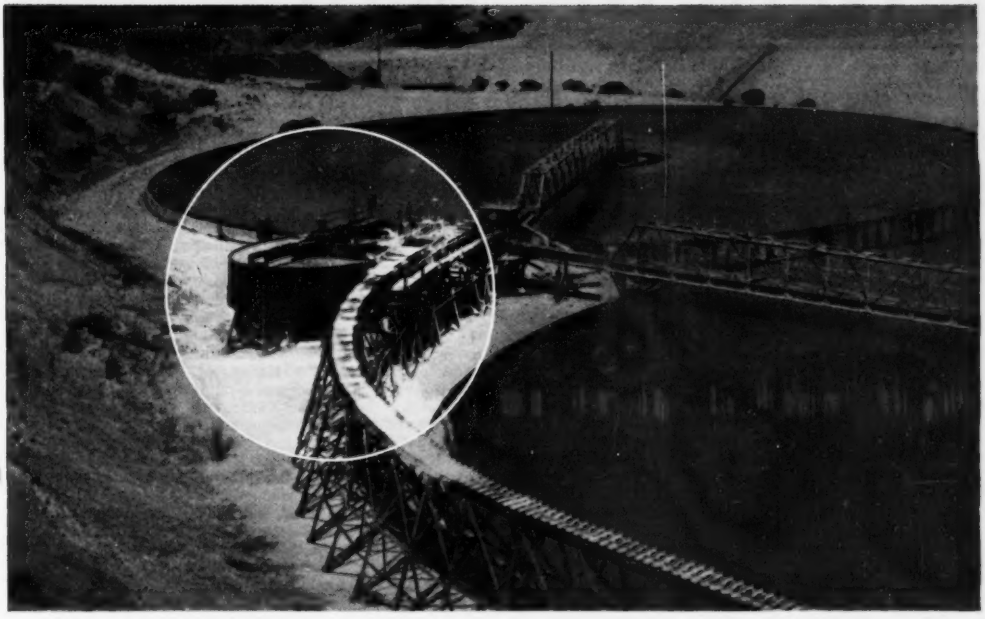
Early in 1918 he was assigned to the Watertown Arsenal as Captain of Ordnance, U. S. Army. On his discharge in 1919, he entered mining geology in San Francisco. In addition to work in this country and Mexico, he did consulting work for companies in Australia, Africa, Yugoslavia and Bulgaria.

In addition to being a member of the AIME for 52 years, receiving from them the Gold Medal of the Legion of Honor, Mr. White was a member of the Society of Economic Geologists, Le Conte Geological Club of California, California Academy of Sciences, Seismological Society of America, Fellow of the American Geographical Society and the Royal Geographical Society, Commonwealth Club of San Francisco, Harvard Travellers, and affiliated with the Phi Beta Kappa Society.

Mr. White, with Bohuslav Stoces, was the author of the textbook, *Structural Geology*. He contributed articles to technical and scientific journals. His professional work on disseminated copper deposits led to formulating guides to such orebodies by a study of the leached croppings; he became convinced that there was no genetic relationship between the ore deposits of a mining district and the associated igneous rocks.

He was truly a scholar; as a teacher, and later as a professional consultant, he patiently gave his friendly advice from his fund of knowledge. A man of high integrity and always a gentleman, his calm dignity, kindness, and exemplary humor were an inspiration. In his quiet, unassuming manner, he enjoyed the many pleasant things in life which made him a gracious host. He was always conservative in his manner of living, which probably contributed to the long span of his professional life

ALFRED W. STICKNEY



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in spite of increased tonnage . . . changing ore characteristics

Here is how one operator solved the problem of increased tonnage and changing ore characteristics . . . with a Dorr Hydroseparator.

To handle a total of 12,000 tpd of copper flotation tailings at 26% solids, the initial installation included two Dorr Torq* Thickeners, each 225 ft. dia. When variables in ore characteristics reduced thickener capacity and increased water loss in the underflow, a Dorr Hydroseparator was installed ahead of the thickeners to compensate for shock loads. The Hydroseparator installation, resulting in better thickener performance, did two things:

1. Mill output *increased* by an average of 1,000 tons per working day.
2. The amount of water lost in thickener underflow *decreased* by 166 gpm.

The Summary of Operating Data shown here gives additional information, before and after the installation of the Dorr Hydroseparator.

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Dorr Hydroseparator
Summary of Operating Data
Castle Dome Copper Co., Miami, Arizona

Year	Feed to System Avg. Tons Per Day	Character of Feed	Percent Solids Combined Underflow
	WITHOUT HYDROSEPARATOR		
1948 (Jan.-June)	10,406	Hard Ore	44.5
Dorr Hydroseparator Installed July 1948			
	WITH HYDROSEPARATOR		
1948 (Aug.-Dec.)	11,436	Hard Ore	45.2
1949	11,814	Variable Ore	46.4
1950	11,905	Variable Ore	47.8
1951	12,076	Variable Ore	47.9

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WASHINGTON IMPACT

Paley Report Forecasts 90% Rise by 1975 in U.S. Needs for Minerals

DEMAND FOR MINERALS in the United States will rise about 90% by 1975; in other free nations, the increase will be even bigger. That's the forecast of the President's Materials Policy (Paley) Commission, made last month in an 813-page, five-volume report on long-term aspects of the nation's materials problem.

The report said the hard core of the materials problem is minerals, but bluntly asserted that absolute shortages are not the big threat. What really worries the commission is "insidiously rising costs." It pointed out that the challenge is to meet expanding demands with expanding supplies while averting a rise in real costs per unit.

In projecting future demand, the report said U. S. mineral consumption would grow by these percentages within 25 years: iron, 54; chromium, 100; tungsten, 150; copper, 43; lead, 53; zinc, 39; antimony, 81; bauxite, 291; magnesium, 1845 (by far the biggest growth of all commodities); mercury, 25; platinum, 30; tin, 18; titanium and cadmium, 324; and nonmetallic minerals in general, 133.

To meet this growing demand, the commission emphasized: "There is no such thing as a purely domestic policy toward materials that all the world must have; there are only world policies that have domestic aspects." In formulating a national materials policy, it said, the overall objective should be to "insure an adequate and dependable flow of materials at the lowest cost consistent with national security." But this reservation is made: The welfare of friendly nations must be recognized, too.

Domestic Output Limited

The reservation is important, for the U. S. is outgrowing its present useable domestic resource base. The commission brought out these points: At the start of the century, we produced 15% more raw materials than we consumed. By mid-century, we were consuming 10% more than we produced. Of more than 100 minerals used by U. S. industry, one-third is now fully supplied domestically, one-third comes partly from home and partly abroad, and one-third comes almost entirely from abroad.

The commission predicts a general 50 to 60% boost in U. S. use of raw materials in the next 25 years. The trend toward greater imports—amounting to maybe one-fourth of what we use—becomes inescapable.

The Paley report's conclusion: We must broaden our useable domestic resource base, tap new sources of supply, and adapt needs to the kinds of supply available. These are highlights on how to do it that affect the mining industry:

Stockpiling "Permanent"

1. Stockpiling should be made a permanent instrument of national policy. Acquisitions should be made at a minimum cost without favoritism to any producer or group of producers, and no withdrawals should be made except in an emergency affecting the national security. Said the commission: "Market stability—an essential to expanding materials production—is best maintained by confidence that no net stockpile releases will be allowed . . . and that excessive or obsolete stocks will be released gradually and with great caution."

2. A permanent agency to succeed DMPA should be set up to make long-term contracts for foreign materials, including standby provisions and price-floor arrangements. This would be part of a general program to stimulate foreign trade and open up new free world materials sources.

3. Small mine operators should get financial aid up to $100,000 to support prospecting for new domestic deposits of strategic minerals. Authorized advances should be about $15-million over five years. Percentage depletion on mineral deposits should be retained as a tax incentive, but present rates should not be raised. The alternative of leasing should be made available for all federal-owned deposits to which the location system now applies—the individual prospector determining which system he prefers. The commission frowned on premium-price plans to foster high-cost output.

4. A complete census of the minerals industry should be taken every five years. Government programs of mineral fact-finding and scientific research should be stepped up. Geological Survey's mapping program, in particular, should be speeded.

(Editor's note: Next month's *E&MJ* will contain a detailed article on the Paley report.)

Raising Nickel Supply

International Nickel Company of Canada, Ltd., produced about 90% of the free world's supply of nickel (118,000 tons a year) at the outbreak of the Korean war. By the end of 1955, Inco's annual output will be up to at least 124,000 tons, but its share of the non-Iron Curtain nickel market will be less than 70%.

The projected drop in Inco's share of the market will be a by-product of a four-year nickel expansion program mapped out by the U. S. Government. Object: To boost annual nickel production in the free world by 47,600 tons—one-third above the pre-Korea supply.

Under this program, DMPA has brought National Lead and Sherritt-Gordon, a Canadian copper producer, into the nickel business, and has encouraged Inco and Falconbridge, a smaller Canadian nickel company, to expand production.

DMPA is now negotiating procurement contracts which would (1) bring M. A. Hanna, a U.S. coal and iron ore producer, into nickel in a large way (yearly output of 9,000 tons by 1954 from deposits near Riddle, Ore.); and (2) put two new Canadian outfits, East Rim Mines and Milnet mines—both in Ontario's Sudbury District—into production.

East Rim will produce 500 tons of nickel this year, 2,000 tons annually by 1954, DMPA has been informed. The company has its eye on Chemico's new leaching technique for the processing plant it hopes to build next year. In the meantime, it will use Falconbridge mill facilities. G. H. Johnson is East Rim's president; Norman Tisdale is director.

Milnet ore will also be processed at Falconbridge. It plans annual output of 1,200 tons by 1953. F. R. Burton, of Lorne Park, Ont., is president; John Drybrough, of Winnipeg, is vice president.

Biggest element in nickel expansion is the reactivation of the government-owned Nicaro plant in Cuba, which began in January. Peak production of 1,250 tons a month will finally be achieved this month. That's a month behind schedule. Probable cause of delay: the April shakeup in ownership of Nickel Processing Co., the private outfit running Nicaro for GSA, which involved Billiton's sale of its 50% interest to National Lead and Fomento de Minerals, a Cuban combine. The latter two had been junior partners. National Lead now holds a 60% interest, and will presumably take over when GSA leases or sells Nicaro to private industry.

Exploration at Nicaro

GSA and National Lead are both confident that Nicaro can be operated profitably in a normal market. One big factor: the belief that additional Cuban ore exists with a higher nickel-bearing content than the ore now processed at Nicaro. The potential here is for 15,000 tons more production annually. The Bureau of Mines will soon start intensive exploration work.

Billiton sold out amidst widely-published charges of "bureaucratic sloppiness and political influence" by GSA, in getting the Dutch company to

run Nicaro in the first place. GSA-DMPA boss Jess Larson vehemently denied the charge; and now says Billiton sold out because it was "irritated by GSA's close supervision of Nicaro operations." Billiton continues to operate the government-owned Texas City tin smelter—apparently unirritated by RFC's equally tight supervision.

If DMPA's nickel expansion blueprint does not balance out supply and demand by 1956—as Larson believes, while NPA is less optimistic—DMPA has these additional nickel sources in mind with an annual potential of 60,000 tons; (1) Inco-controlled deposits in Venezuela's Loma de Nierro District; (2) deposits near Goiaz, Brazil, controlled by Ventures, Ltd. of Canada, and (3) newly discovered deposits on the north rim of the Sudbury basin, being developed by Falconbridge. These are all high-risk projects that would require substantial capital investment. And the companies are reluctant to exploit them without heavy U.S. financial help.

Point Four Program

Mining is a relatively small activity in the State Department's global Point Four Program, under which technical aid is given "under-developed" countries. Only about $850,000 of the current $200-million budget for the Department's Technical Cooperation Administration is allocated to 13 mining projects. Only 41 of TCA's 861 technical personnel in the field are mining specialists, most of them on lease from the Bureau of Mines or the Geological Survey. These are the Point Four mining projects:

1. Coal mining in Afghanistan.
2. Improving Bolivian tin recovery processes. Current research is now being conducted at the Bureau of Mines Laboratory in College Park, Md.
3. Geologic investigations in Brazil's Minas Gerais, where deposits of high-grade iron ore, beryl, bauxite, cobalt, manganese, and tungsten occur.
4. Construction of a lead refinery in Brazil.
5. Coal mining in Colombia.
6. Geologic investigations of beryl and mica in India.
7. Lignite investigations in Madras, India.
8. Geologic investigations for phosphate, lead, zinc, copper, cobalt, tin, and manganese in Mexico (Sonora, Morales, Baja California, Conceptcion del Oro-Mazapil).
9. Metallurgical research on manganese, tungsten, tin, lead, copper, zinc, antimony, and fluorspar in Mexico.
10. Study of lead, zinc, and cobalt mining methods in Nepal.
11. Geological investigations of lead and zinc deposits in Peru.
12. Survey of mineral resources in the Philippines, particularly manganese. (Mutual Security Agency assumed jurisdiction of this project in January.)
13. Geologic investigations of Saudi Arabia's mineral resources.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

UNIONS FLEX MUSCLES: June was the month labor leaders had to talk tough. CIO President Philip Murray's steel strike headed for a showdown in Congress. John L. Lewis aimed to take on the coal operators. Mine, Mill and Smelter Workers had to generate some steam for a new wage drive in copper. And Congress was firing away at the Wage Stabilization Board, Labor's friend. This was no time for labor to look soft.

Ignore injunction? Murray, without saying so, wanted to make it look as though the steel workers might ignore a Taft-Hartley 80-day injunction to end the strike. And he got help from the White House. Truman told the press he didn't think the union would respect an injunction since the steel strike already had been delayed more than the 80 days. But this could be costly. Lewis and his United Mine workers have paid $2,130,000 for ignoring 1946 and 1948 injunctions.

USING TAFT-HARTLEY: Until he balked in the steel strike, Truman had gotten 80-day injunctions six times to prevent national emergency strikes. Twice against Lewis. Last summer against Mine-Mill in copper, once in atomic energy, maritime, and longshoring. Never against Murray.

LEWIS'S MILLIONS: Lewis made his usual grandstand play in giving Murray $10-million credit—if he needed it—at the Washington bank controlled by UMW. Lewis likes to toss his union's millions around. They get good publicity, boost striker morale, but seldom are taken up. More often, it's a typical Lewis maneuver to show up other unions as weak, the UMW as strong.

MINE-MILL SUPPORT: Mine-Mill doesn't have millions. Its officers could offer only moral support while warning that the bargaining power of all unions hinged on the success of the steel strike. Mine-Mill officers didn't overlook the chance, either, to capitalize on Murray's predicament. At a time when it appeared Murray was going to have to take less than the Wage Stabilization Board recommended, Mine-Mill's leaders said the steel strikers should stay out until they got the full 26¢ package. Thus, if Murray settled for less, Mine-Mill would use it against the CIO union in their non-ferrous metals rivalry. Some observers see this as possibly reflecting a fear in Mine-Mill that the CIO is making serious gains among the Mine-Mill rank and file.

LEAD-ZINC RAISES: All kinds of trouble, it was predicted, will result from the wage increases recommended by WSB for CIO steel union members in three Utah mines—U. S. Smelting, Combined Metals Reduction Co. and New Park Mining Co. With job evaluation, the increases fell in the 18 to 20¢ package pattern set by the CIO last year at American Smelting and Refining's Garfield smelter. The Defense Materials Procurement Agency worried that, with lower lead and zinc prices, the mines couldn't stay open under increased labor costs, thus cutting production for defense. Industry voices added this warning: Favored treatment given the CIO will stir up trouble with Mine-Mill. They described the Union-Wage-Price situation as "an explosive mixture which inevitably is going to precipitate the entire non-ferrous metal industry into turmoil, strikes and a shut-down this summer."

MINE-MILL IN CANADA: At Vancouver, Mine-Mill sponsored a concert by singer Paul Robeson, Communist sympathizer. At Sudbury, Local 598 insists it should have something to say about how the International Nickel Co. bonus system operates.

BARGAINING PROPAGANDA: A film strip—"Mobilization Will Win in '52"—is being prepared by Mine-Mill to ballyhoo wage demands. Something like the left-wing United Electrical Workers' film on General Electric, it attacks metal-mining profits, the wage "freeze" and government intervention in labor disputes. It will be sold to locals for $5 to stimulate rank-and-file backing.

KENNECOTT HOSPITAL: Mine-Mill Local 890 got NLRB to schedule a bargaining election among employees at the hospital maintained by Kennecott Copper Corp. at Santa Rita (N.M.) open pit mine and the branch dispensary at the Hurley operations. NLRB rejected company claims that the board lacked jurisdiction and that, if it did have jurisdiction, it should not exercise it over hospital employees.

LABOR IN POLITICS: Mine-Mill and other left-wing unions likely won't support either of the two major candidates for president. Nor will they have another Henry Wallace to get behind. They will continue to snipe at both Democrats and Republicans, *Daily Worker* style.

MARKETS—Trends and Prices *(Continued from page 69)*

U. S. Mine Production of Recoverable Copper

(Bureau of Mines—In Tons)

Region and State	Jan.-Dec. 1951 (a)	January 1952	February 1952	March 1952 (b)	April 1952
States east of the Mississippi					
Michigan	24,580	2,328	2,021	1,948	2,338
Other	16,208	1,443	1,215	1,349	1,165
Total	40,788	3,771	3,236	3,297	3,503
Missouri	1,845	184	146	170	165
Western States:					
Arizona	417,000	35,110	30,985	35,530	34,550
California	830	70	70	80	80
Colorado	3,230	232	271	335	315
Idaho	1,972	214	239	247	230
Montana	55,613	4,430	4,892	5,374	5,124
Nevada	56,310	3,370	4,270	4,140	5,310
New Mexico	73,100	6,900	6,448	6,784	7,100
Oregon	11	.....	.....	.....	.....
Texas	1	.....	1	.....	.....
Utah	273,700	22,970	21,665	22,400	23,640
Washington	4,175	440	341	494	342
Total	885,942	73,736	69,182	75,384	76,691
Alaska (c)	1	.....	.....	.....	.....
Total United States	928,576	77,691	72,564	78,851	80,359

(a) Compiled from monthly mine reports. (b) Revised. (c) Based on smelter receipts.

Official London Prices

Consumers in the United Kingdom obtain copper, lead and zinc at prices named by the British Ministry of Metals. Delivered prices in effect as June ended were as follows:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	281	0	0
Fire refined, high conductivity	281	0	0
Fire refined, high grade	280	0	0
Fire refined, min. 99.7 percent	280	0	0
Fire refined, min. 99.2 percent	279	10	0
LEAD:			
Soft, foreign duty paid	137	0	0
Soft, Empire	137	0	0
English, refined	138	10	0
ZINC:			
Foreign (G.o.b.) duty paid	130	0	0
Domestic (G.o.b.) duty paid	130	0	0
Prime Western and debased	130	0	0
Refined and electrolytic	134	0	0
Minimum 99.99 percent	136	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

June 30, 1952

Aluminum, ingot, 99 plus percent, lb. (base price)	19c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	42.47c.
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.25
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb.	$2.40
Indium, troy oz.	$2.25
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	56½c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$195 @ $198
Selenium, 99.5 percent, lb.	$3.00 @ $3.50
Silicon, minimum 97 percent, carloads, lb.	20c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 percent, lb.	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per unit	$36.50
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3 no ratio	$27.00 @ $28.00
48% Cr_2O_3 3 to 1 ratio	$44.00 @ $56.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$8.70
Mesabi bessemer	$8.45
Mesabi, non-bessemer	$8.30
Lead (Galena), 80 percent, Joplin, Mo., ton	$209.95
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.22 @ $1.24, c.i.f. U. S. ports, duty extra. Long-term contract nominal at 90c. to 95c., c.i.f., duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb.	$2.00 @ $2.55
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, U. S. equivalent, duty extra	$56.50 @ $59.50
Domestic, scheelite, 60 percent f.o.b. mill	$65.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$100.00

(a) F.o.b. port of shipment.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½c.
Cobalt Oxide, 72⅔ to 73⅓%, ceramic grade, per lb.	$1.82 @ $1.84½
Copper Sulphate, 100 lb.	$8.95 @ $9.95

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	21¾c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$185.00
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$4.85
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, per lb. contracts	9.9c.
Spiegeleisen, per long ton, 19 @ 21 percent grade	$75.00

NON-METALLIC MINERALS

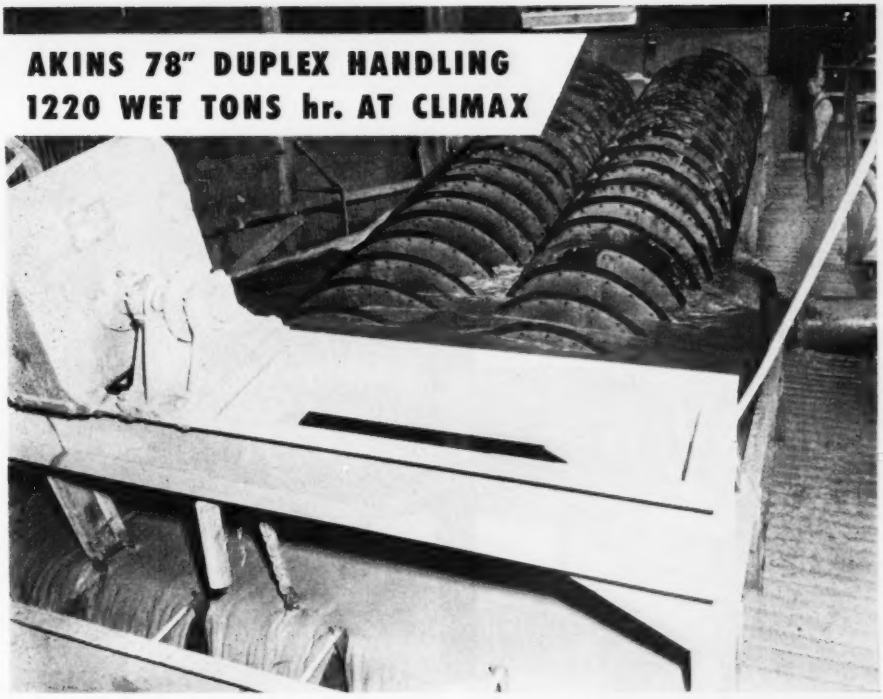
Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$275 @ $475
Shingle fibers	$123 @ $170
Paper stock	$85 @ $119
Waste	$63 @ $70
Shorts	$30 @ $63
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or shorts	$34.00 @ $63.00
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$10.15 @ $10.40
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $4.50 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective ton	$43.00
60% effective CaF_2	$40.00
Acid 97% concentrate, bulk, ton	$60.00 @ $65.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$36.30
Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap, $32 and up.	
Ocher, Georgia, ton, in sacks	$26.25
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$52.00
Steel, f.o.b., Pittsburgh billets, net ton	$56.00
Structural shapes, 100 lb.	$3.65

AKINS 78" DUPLEX HANDLING 1220 WET TONS hr. AT CLIMAX



The Climax Molybdenum Corporation was confronted with the problem of not having sufficient room in the mill for enough classifiers to make a separation of sands and slime prior to final disposition of tailings from the by-products plant.

To answer the problem CIW engineers designed the largest classifier ever built, a 78" duplex, to go in the space available. Feed averages 1220 wet tons/hr. @ 31% solids, overflowing 846 tons/hr. @ 13% solids, with sand discharge averaging 375 tons/hr. @ 72% solids. Classifier feed is 44% plus 65 mesh, sand discharge 65% plus 65 mesh and overflow 1% plus 65 mesh.

Like many other successful mining companies, Climax buys Akins exclusively.

NEW TYPE BEARING AND LIFTING DEVICE

This 78" unit includes all the outstanding features of the Akins in addition to a new type bearing and lifting device designed to permit construction of such a large classifier.

LET OUR EXPERIENCED CLASSIFICATION ENGINEERS HELP YOU ON YOUR PROBLEMS

COLORADO IRON WORKS CO.

COLORADO IRON WORKS CO.
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REPRESENTATIVES

Canadian Locomotive Co., Ltd., Kingston, Ont., Can., Licensed Manufacturer—Head, Wrightson & Co., Ltd., Stockton on Tees, Eng., Licensed Manufacturer—John Carruthers & Co., (Pty.) Ltd., Sydney, Aus., Licensed Manufacturer—Head, Wrightson & Co., S. A., (Pty.) Ltd., Johannesburg, Licensed Manufacturer—Edw. J. Nell Co., Manila, P. I., Sales Agents—Wright Bros., Credit Foncier Bldg., Vancouver, British Columbia, Sales Agents.

teamwork in specialties

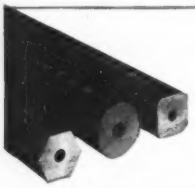
THE BLACKSMITH

Crucible Hollow Drill Rods

When the drill bit bites into rock, its hollow drill rod gets as many as 2500 wrenching impacts a minute. The blacksmith plays an important part in maintaining the quality of this steel. It's up to him to forge and temper it until it has exactly the right balance of surface hardness, toughness and fatigue strength. With Crucible Hollow Drill Rod, the blacksmith can count on getting this balance every time. For this drill rod is backed by Crucible's years of experience in specialty steel making.

Records of drilling operations prove Crucible Hollow Drill Rod's ability to take it. Service life is high; breakage and bit loss are at a minimum.

For long life and low maintenance, use Crucible Hollow Drill Rods.



CRUCIBLE

first name in special purpose steels

HOLLOW DRILL RODS

52 years of Fine steelmaking

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

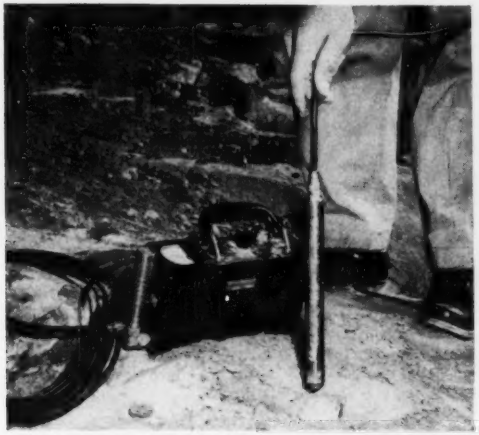
REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

E&MJ

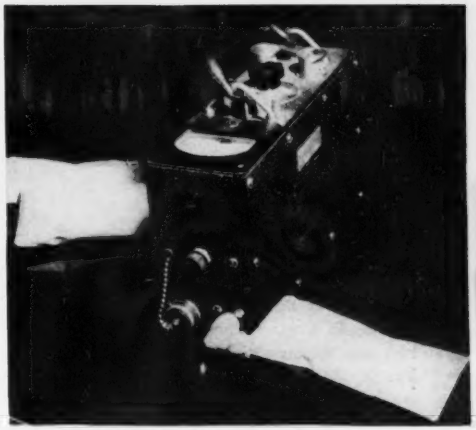
NEW PRODUCTS DIGEST

For further information on these products, circle item numbers on card—insert and mail.

FEATURE



PROBE ATTACHMENT makes the counter adaptable for logging drill holes as well as for general prospecting.



GEIGER COUNTER features a dial that can be read directly in percentage U_3O_8. Can be used for assays.

Geiger Counter Assays Radioactive Ores

A DIAL THAT READS directly in percentage of U_3O_8 makes Minerals Counter Model 600 adaptable for assaying radioactive ores as well as for uranium prospecting. A probe attachment also permits the logging of drill holes.

Five ranges of sensitivity are controlled by the large fluted knob in the center of the counter. No. 5 position, the most sensitive, is for prospecting and determining small amounts of uranium in hand samples and pulps. No. 1 is for measuring intense radiation.

A one-stage amplifier, pulse generating circuit, and balanced bridge type electrometer, make up the integration circuit. The left knob balances the bridge circuit—or unbalances it, to compensate for, or zero out, low background count when assaying ore samples.

Size of pulses in the pulse-generating circuit is controlled by the right knob, thus controlling meter deflection for a given amount of radiation.

Low, medium, and high rates of integration time are controlled by the switch below the meter. Medium is usually sufficient; high or long-time integration may be needed on low-grade samples.

In assaying, the No. 4 sensitivity scale is used. The pointer is zeroed in to eliminate small amounts of background count. Next, the tube is calibrated against a standard sample (preferably assaying 0.40 to 0.60% U_3O_8). When the meter has been adjusted to read the same as the assay for the standard, and return to zero when the standard is removed from the tube, the counter is ready to check unknown samples. If the background count is high, it should be measured on scale No. 4 and added to the assay of the standard.

All assay readings must be taken under identical conditions to get good results. This means grinding to the same mesh, using the same quantities. If regular pulp envelopes are used, spread all samples to uniform thickness. All containers should be placed on tube, in same position, and other samples should be kept at least 5 ft away.

The Minerals Counter is made by Minerals Engineering Co., Grand Junction, Colo. Circle No. 1 on card opposite page 118 for details.

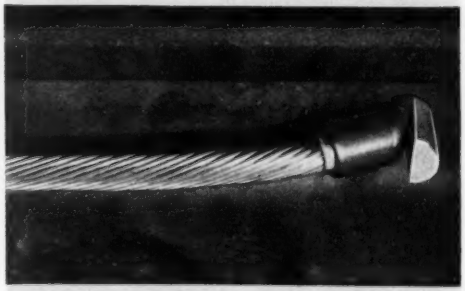
CUT BONDING TIME BY 75%

Bond four times as fast with O-B Wedge Bonds! In average haulage conditions your two-man welding crew can probably install five bonds per hour. During the same time, we know that one man can install ten O-B Wedge Bonds. When you reduce this to man-hours, it develops that 100 welded bonds represent 40 man-hours of installation time, while the same number of O-B Wedge Bonds require only ten hours! A saving in time like this is certainly worthwhile, isn't it? - especially when you consider that there are other advantages in wedge bonding. Repeated use, for example, makes your supply of bonds go further. Metal-to-metal contact between the bond terminal and the rail makes a better electrical connection than a welded application.

Make your bonding dollars last longer and do more by specifying O-B Wedge Bonds on your next order.

Drilling rail web with an O-B Electric Mobildrill.

Second terminal is tightened in hole with a few hammer blows. 20,000 pounds of expansion pressure hold the terminal permanently tight.



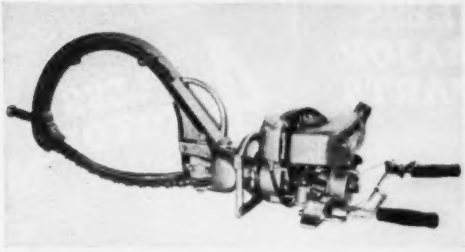
The completed job. Bond may be easily reclaimed by driving the wedge from the hole with a few hammer blows from opposite side of rail.

Ohio Brass

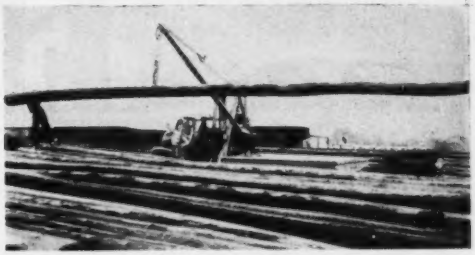
MANSFIELD OHIO, U.S.A.

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

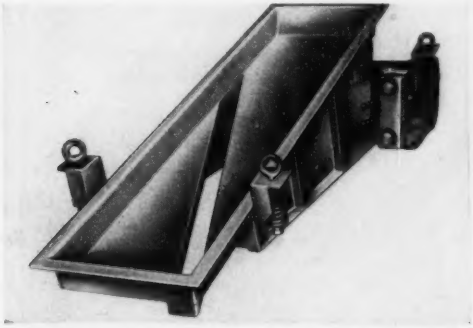
4284-M



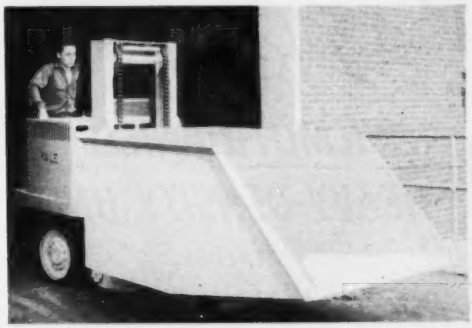
TWO-MAN CHAIN SAW is powered by 32-lb. gasoline engine, has handy controls and fully automatic clutch. This model has 19-in. capacity; others up to 28 in. Titan Chain Saws Inc., Seattle, Wash. (2)



HYDRAULIC CRANE can be mounted on frame of any truck 1½ tons or larger. "Hydra-Lift" requires only 40 in. space behind cab, has capacity of 6,400 lb. Boom telescopes from 12 to 22 ft. Pitman Mfg. Co. (3)



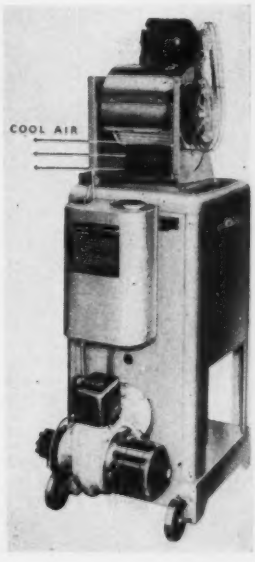
VIBRATING FEEDER with electromagnet drive, discharges an even curtain of material through diagonal slot. Feed rate is easily controlled. Comes in several sizes. Syntron Co., Homer City, Pa. (4)



PLATFORM TRUCK with 4,000-lb. capacity has an 80 cu.ft. end-dump hopper which can scoop up loads or be filled from overhead. Elevating mechanism dumps hopper. Yale & Towne Mfg. Co., Philadelphia, Pa. (5)

GEIGER COUNTER weighs less than ½ lb., including headphones. It's just 1 in. dia. and 4 in. long. Trade-named the "Geiger-Mite," it does not require batteries and is self-charging. Power is supplied by a self-contained electrostatic generator and energy storage unit. The unit is permanently sealed and waterproof. For initial charge, shake up and down about 30 times. Price is $29.95. Morgan Instrument Co., Canoga Park, Calif. (6)

For more information, use convenient reply card opposite p. 118



PORTABLE FURNACE delivers 189,000 Btu in winter, circulates cool air in summer. By spraying heat out at floor level over an area of about 3,000 sq. ft., heat is concentrated in the work zone from the floor to about 6 ft. in height. In five minutes the top blower mounting can be changed to have machine deliver 1,500 cfm of cool air. Fageol Heat Machine Co., Detroit, Mich. (7)

5 LESS MAJOR PARTS

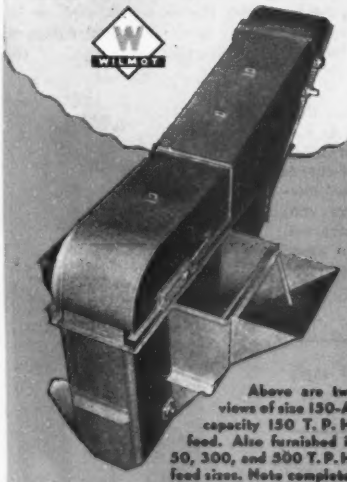
4 LESS MOTORS

New

WILMOT-DANIELS HEAVY-DENSITY UNIT

FEATURES

Remarkable Simplicity



Above are two views of size 130-A; capacity 150 T. P. H. feed. Also furnished in 50, 300, and 500 T. P. H. feed sizes. Note complete-in-1-unit construction.

In addition to eliminating such common heavy-media problems as fluctuation of bath density and loss of product to refuse, the new Wilmot-Daniels Heavy Density System also introduces radical advances in simplicity. For instance: this system requires no densifier; no thickener, no thickener tank, no thickener pump; and magnetizing blocks are eliminated. In addition to these 5 major parts, 4 less motors are required. Refuse is moved by a simple drag-line conveyor. As a result of this compactness, the Wilmot-Daniels Heavy Density System requires about 20% less floor space than other heavy-media systems. To further lower the cost of installing this system, it is custom-designed to fit your floor space. This can effect substantial savings over "package units".

Send for **BULLETIN 52!**

Let us send you complete technical details of how this new system operates and cuts costs for metal and coal producers.

WILMOT ENGINEERING CO.

HAZLETON, PA.
Plant:
WHITE HAVEN, PA.

HEAVY DENSITY DIVISION

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

SMOKE RECORDER. If you're interested in stack smoke density and combustion performance, this two-page sheet issued by Ess Instrument Co., Bergenfield, N. J., tells about an instrument that will help you. Wiring and installation diagrams are also included in Bulletin 512. (41)

CRUSHER. The American "AC" type rolling ring crusher is described in an eight-page bulletin released by American Pulverizer Co., St. Louis, Mo. Used primarily in coal, where the manufacturer reports total operating costs of less than 1¢ per ton, this type crusher can be applied to soft rock. (42)

HYDRAULIC PUMP. The Kobe Triplex Pump is a self-contained, high-pressure hydraulic power source. A six-page bulletin contains installation data and an operating description with discussion of special applications where pressures up to 20,000 psi are required. Kobe Inc. Division of Dresser Equipment Co., Huntington Park, Calif. (43)

STATIONARY DIESELS. A complete description plus illustrations, specifications, ratings and accessories available, are given in an eight-page folder published by the Engine Division of National Supply Co., Springfield, Ohio, describing their Models 60 and 80 Superior engines. (44)

SCRAPERS. Caterpillar Tractor Co., Peoria, Ill., will be glad to send you Booklet No. 30375 which covers their line of scrapers (nine sizes) for use with track-type and wheel-type tractors. Included are photographs, descriptions and specifications. (45)

ALUMINUM ALLOYS. Here's a 24-page folder that covers the composition, typical mechanical properties, heat treatments, and basic foundry applications of the standard aluminum alloys produced by Apex Smelting Co., Chicago, Ill. Each alloy is cross-referenced to ASTM, SAE, and Alcoa designations of alloys with similar composition and properties. (46)

HINGED-STEEL BELT. This belt will handle, hot, wet and/or abrasive materials and can be assembled in almost any width or length. Catalog MF-530 offered by May-Fran Engineering, Inc., Cleveland, Ohio, contains all the pertinent details. (47)

DRYERS. There's a lot of information on the drying, cooling and processing of bulk materials in the 24-page book No. 2409, on Multi-Louvre driers, issued by Link-Belt Co., Chicago, Ill. The unit itself is widely used, according to the manufacturer, where fast treatment and accurate temperature control are required. (48)

INDUCTION MOTORS. Construction features, ratings and dimensions of Allis-Chalmers open drip-proof and splash-proof, squirrel-cage induction motors in ratings of ½ to 100 hp., are described in bulletin 51B6210D issued by Allis-Chalmers Mfg. Co., Milwaukee, Wis. (49)

AIR PUMPS. This brief bulletin gives you complete performance and size specifications, suggested uses and illustrated descriptions of air-pressure or vacuum pumps for laboratory applications. Published by Eberbach Corp., Ann Arbor, Mich. (50)

DRILL BITS. Some unusual bits for several types of mining tools are illustrated and described in a catalog released by Firth Sterling, Pittsburgh, Pa. (51)

ARMORED FLOW METER. A 12-page booklet (Catalog 40) gives you all the information you need on armored variable-area flow meters (Flowrator) which are designed for high temperature and high pressure and for use where liquid hammer and hazardous fluids make ordinary meters impractical or dangerous. Fischer & Porter Co., Hatboro, Pa. (52)

TORQUE CONVERTER. Information on the Torcon heavy-duty, automatic, hydraulic torque converter is furnished in a four-page illustrated Bulletin No. TC-639 put out by Torcon Corp., Ashtabula, Ohio. This unique transmission combines a hydraulic torque converter and hydraulic coupling in a single unit and retains advantages of both. (53)

WIRE ROPE. Here's a handy pocket-size book just loaded with information about wire rope in general and Mac-Whyte wire rope in particular. This is the Ninth Edition of this popular catalog put out by MacWhyte Co., Kenosha, Wis. (54)

TEMPERATURE CONTROLS. This 12-page catalog (No. G-17) describes and illustrates the full line of temperature controls made by Burling Instrument Co., South Orange, N. J. (55)

FLEXIBLE DUCTING. Bulletin 34 describes several uses and advantages to be gained by using strong, lightweight, flexible ducting for ventilation, air conditioning, dust collecting, and fume control. American Ventilating Hose Co., New York, N. Y. (56)

BATTERY TRANSFER RACK. Why and how you can change batteries safely, quickly and easily to get more service from your locomotive is answered in a four-page bulletin released by Mancha Storage Battery Locomotive Division, Goodman Mfg. Co., Chicago, Ill. (57)

TRACTOR ATTACHMENTS. "Attachments increase profits" is the claim of this indexed catalog which proceeds to explain uses and construction of attachments for Caterpillar diesel tractors which will help you get

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to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

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1	8	15	22	29	36	43	50	57	64
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6	13	20	27	34	41	48	55	62	69
7	14	21	28	35	42	49	56	63	70

My Name ..... Position .....

Company .....

Address .....

more work out of the unit. Caterpillar Tractor Co., Peoria, Ill. (58)

DIAMOND WHEELS. If you have a bit sharpening or tool sharpening problem, this catalog on diamond wheels and hones may have the answer for you. It's filled with information about these products of J. K. Smit and Sons, Inc., Murray Hill, N. J. (59)

AIR TRAMMER. If you have been wondering whether or not an air trammer might do that "in-between" haulage job for you, you may get some ideas from this four-page folder on Mancha's air trammer, issued by Goodman Mfg. Co., Chicago, Ill. (60)

CONVEYORS, ELEVATORS. Photographs, typical layout drawings, engineering data, calculation tables, charts and formulas fill this 28-page Book No. 2475 on Bulk-Flo conveyors and elevators made by Link-Belt Co., Chicago, Ill. (61)

TRACTOR MAINTENANCE. "Maintenance Guide for Track-Type Tractors" offers a lot of information on the care and feeding of your Caterpillar, in cartoon format. Caterpillar Tractor Co., Peoria, Ill. (62)

WIRING SYSTEM. "20 Questions and 20 Answers on Safety Mineral Insulated Wiring" is General Cable Corp.'s (New York, N. Y.) brochure which describes and illustrates the characteristics and advantages of this new wiring system. A complete table of types, sizes, weights and lengths as well as a partial list of users are included. (63)

VIBRATOR. "Vibrolator" is a device that produces vibration for your bins and hoppers by using the principle rotation instead of reciprocation. A steel ball spun around and around its two-rail race inside a housing at high speed by compressed air, generates a number of powerful, all-direction vibrations. Only one moving part. This bulletin from Martin Engineering Co., Kewanee, Ill., describes this new development in vibrators and discusses its advantages. (64)

Equipment Shorts

FILTRATION FABRICS. Designed for efficiency in dry-separation equipment and dust collectors, two new Orlon weaves, Feon 425 and Feon 426, are especially suited for use with hot, corrosive materials. They can be used at operating temperatures up to 300 deg. F. and resist attack by strong mineral acids, chlorine and other oxidizing agents, common solvents, oils, and weak alkalies. Other Feon fabrics will handle strong alkalies. Filtration Engineers Inc., Newark, N. J. (21)

PLASTIC TAPE. Although only 7 mils thick, Panther plastic tape will withstand 10,000 v. and has an insulation resistance of over 1-million megohms per 10 sq. in. of tape. It will withstand 20 lb. pull per inch of width without breaking. The new tape adheres to any dry surface even at low temperatures. Resists water, oils, chemicals and withstands weather extremes. Okonite Co., Passaic, N. J. (22)

TRUCK ENGINE. High compression truck engine weighs only 545 lb. and generates 145 gross brake hp. at 3600 rpm, to give it the best power-to-weight ratio in the trucking industry according to the manufacturer, General Motors Corp., Pontiac, Mich. (23)

LUBRICANT. Here's what Shell Oil Co., New York, N. Y., says about their new Rimula oil: ". . . features a combination of additives never before attained on a commercial basis and is designed to substantially extend the serviceable life of automotive-type diesel engines as well as certain gasoline engines operating in some industrial stop-and-go, low temperature service." (24)

SAFETY HELMET. Fiberglass safety hat weighs 12 oz., is fireproof, weatherproof and adjustable to all head sizes from 6⅛ to 8. Industrial Products Co., Philadelphia, Pa., supplies it in five standard colors. (25)

CHAIN DRIVE. An oil-impregnated sintered bussing chain that requires little or no lubrication is available from Whitney Chain Co., Hartford, Conn. (26)

WELDING INSPECTION. The technique of "hot radiography" permits the taking of X-ray photographs of large pipes, valves and similar units at temperatures as high as 1200 deg. F. This process, called the McElroy-McNutt hot radiography process, can save many hours by permitting rapid inspection of partially completed welds on hot sections of pipe to check for possible defects. Sam Tour & Co., New York, N. Y. (27)

PLASTIC PACKING. Extruded Teflon plastic packing designed for difficult packing applications, has been introduced by Flexrock Co., Philadelphia, Pa. The manufacturer reports that it has proved successful in centrifugal pumps handling acids, caustics and hard-to-handle solvents, operating at varying speeds up to 3500 rpm. Called Teflon Plastic Packing #403, the product is composed of shredded Teflon, blue asbestos with suitable binders and lubricants, and extruded into an open jacket for easy installation. (28)

WELDING GUN FOR THERMOPLASTICS. American Agile Corp., Bedford, Ohio, makes a welding gun for welding thermoplastic materials such as polyethylene, hard polyvinylchloride, etc. Both gas-heated and electrically-heated types are available. Heat is applied by means of a stream of an inert gas such as nitrogen which emerges from the gun at temperatures ranging from 300 to 700 deg. F. This heat will weld plastics used in fabricating chemical tanks, pipe lines, tank liners, containers, etc. (29)

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WHEN A DIAMOND DRILL BIT "GETS IT IN THE RIBS" THAT'S GOOD!

Nature made the selected industrial diamond the most perfect of cutting elements, yet, few of the finer diamonds are in themselves, perfect.

Almost invariably, each has a minute but fortunate distortion in structure which is caused by the presence of the vital "hard vector" or "rib," known even to the ancients as the supreme cutting edge in nature's supreme cutting instrument.

It is traditional in the diamond setter's craft that this "rib," whenever discernable, shall be set "toward the work" so that each diamond may deliver maximum cutting power.

In Truco Diamond Drill Bits, these hard ribs "toward the work" are your assurance of maximum footage at minimum cost. And, when your Truco bits "get it in the ribs," that's good, because the ribs are there to take it.

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STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol Multi-Service Oils

UNITS Compressors 14×12 14×12 14×14
9×12 7½×12 10×14

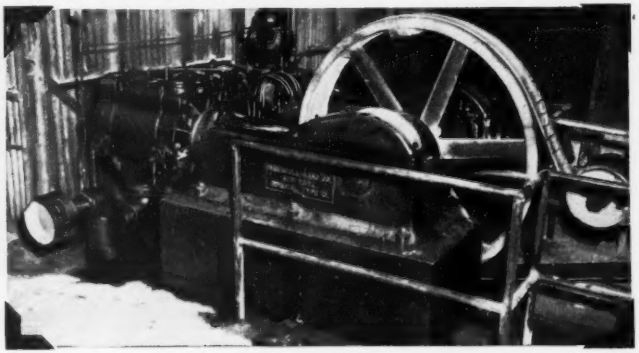
LUBRICATOR Force feed and crankcase.

CONDITIONS Extreme dust conditions

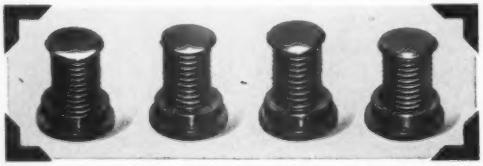
PERIOD 7 years

FIRM U. S. Lime Products Corp., Sonora, Calif.

Lime mine compressor rings still good after 7 years!



LUBRICATED WITH CALOL MULTI-SERVICE OIL 55X, this is one of three Ingersoll-Rand compressors that supply all air for the Sonora, Calif., mine of the U.S. Lime Products Corp. Heavy coating of lime dust on the air intake and floor indicates the extreme conditions under which the compressor works. Even so, when pistons were pulled for the first time after seven years, rings were found to have no deposits, ports and grooves were free and clean—and the entire assembly was returned to operation.



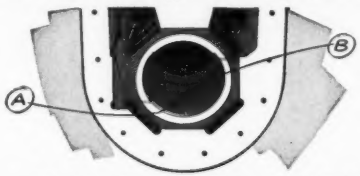
THESE VALVES, taken from the compressor's low side, get the first dust from the air intake. Note how they are free from all deposits.

FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

Now CALOL Multi-Service Oil cuts costs in all types of compressors



In crankcase and on cylinders, Calol Multi-Service Oil reduces wear and oil consumption—has cut consumption 20% in air compressors.

A. Oxidation-resistant compounds prevent formation of varnish. Detergent keeps contaminants suspended in oil, prevents foam.

B. Special compound assures "hot-spot" lubrication...covers surfaces rapidly.

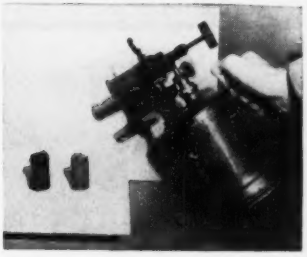
Calol Multi-Service Oils also recommended for pumps, diesel engines, enclosed gears.

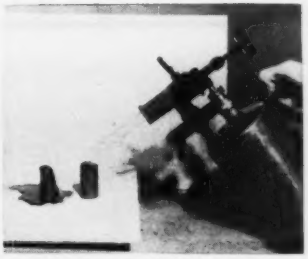
FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

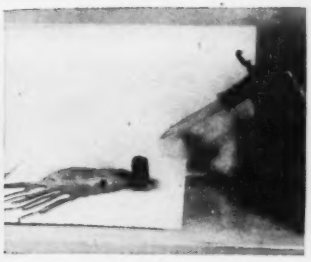
STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

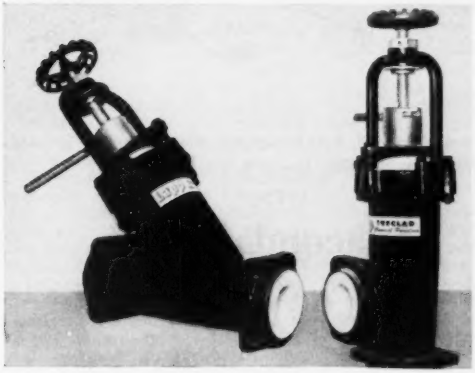




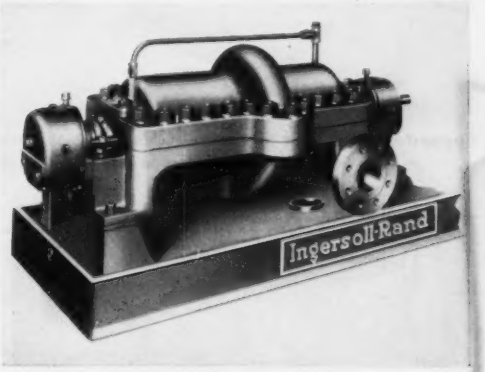


New Lubricant Remains Effective at High Temperatures

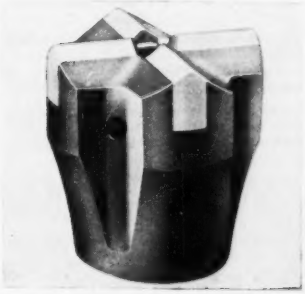
A SYNTHETIC-BASE LUBRICANT, Sotol, demonstrates its resistance to heat. In the picture at left Sotol is placed side by side with another industrial lubricant. The next two pictures show results as blow-torch heated both masses to 1,000 deg. F. Sotol held its form and, according to the manufacturer, its lubricative powers even with more heat applied. Southwestern Petroleum Co., Fort Worth, Tex., makes Sotol. (8)



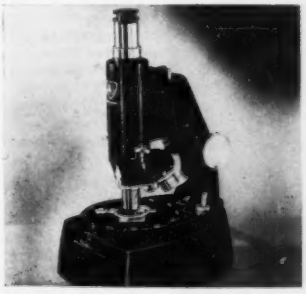
PORCELAIN VALVE, armored with fiberglass-reinforced plastic is another weapon in the war against corrosion. "Tufclad" also protects porcelain against thermal shock. Lapp Insulator Co., Inc., Le Roy, N. Y., is the manufacturer. (9)



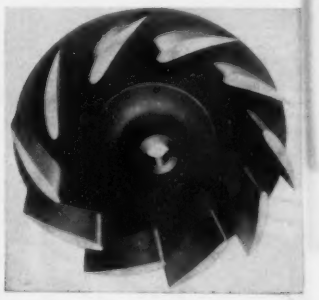
MULTI-STAGE PUMPS made by Ingersoll-Rand Co., Phillipsburg, N. J., have been redesigned for medium pressure applications for such services as mine-dewatering to 800 psi. Built in 1½, 2, 2½ and 3-in. sizes, with four, six or eight stages. (10)



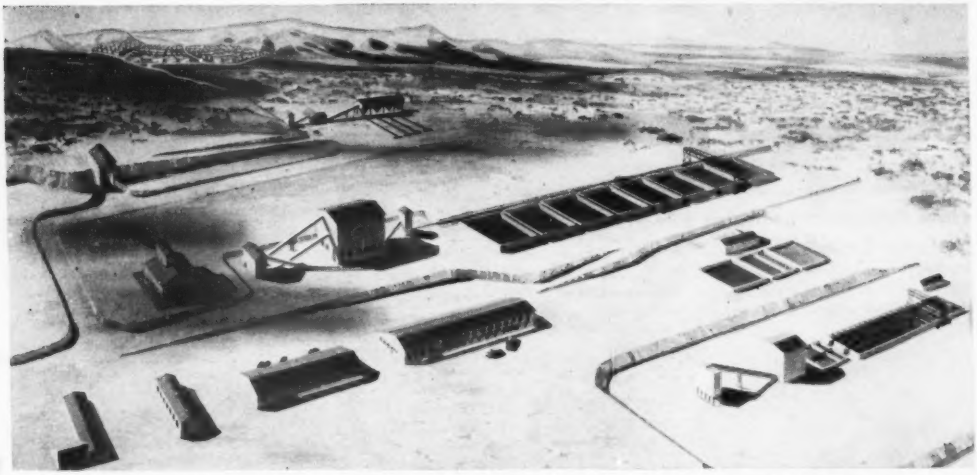
TUNGSTEN CARBIDE BITS. A newcomer to this field, Brunner & Lay, Inc., Franklin Park, Ill., offers Rok-Bits in sizes from 1¼ to 4 in. Design features include full body support of inserts and balanced air hole positioning for efficiency in blowing. (11)



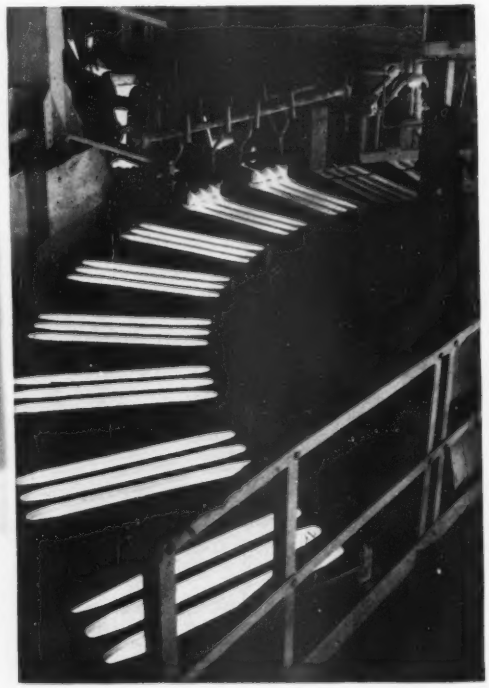
POLARIZING MICROSCOPE is designed for crystallography, chemical microscopy, and petrography. Magnifies up to 430X and cost is said to be about one-third of existing instruments. Angles can be estimated to 1 deg. American Optical Co., Southbridge, Mass. (12)



CENTRIFUGAL FAN is a non-overloading type that is over 90% efficient with only one-third of the noise intensity of previous models, according to the maker, the Sturtevant Division, Westinghouse Electric Corp., Pittsburgh. Delivers up to 600,000 cfm. (13)



Copper mining. This new oxide-leaching plant at Yerington, Nev., will have a capacity of 66-million lb. of copper per year, and will start in late 1953. The orebody has 35-million tons of 0.97% oxide ore.



Copper wire bars. This rotary casting machine at the AS&R Co. plant, Perth Amboy, N. J. is part of the company's improvement of fabricating facilities.

Anaconda Builds on a Big Scale

ANACONDA COPPER MINING CO. is now at the midpoint of what is perhaps the largest postwar expansion by a nonferrous metals company in the United States. In a total program estimated at $289-million, Anaconda has spent $142-million and will spend the balance between now and sometime in 1954. These are the main expansions and improvements:

COPPER		ZINC	
Chuquicamata	$111-million	Processing Facilities	$8-million
Greater Butte	$27-million	BRASS	
Yerington, Nev.	$38-million	Improvements at mills	$27.5-million
Cananea	$10-million	URANIUM	
Refining & Casting	$5.5-million	Ore treatment, N.M.	$4-million
ALUMINUM		OTHER	$13-million
Montana Project	$45-million	TOTAL	$289-million

Copper production still bulks large on Anaconda's list, but the last year has seen the company prepare to enter two more fields—aluminum and uranium.

In terms of either dollars or output, the sulphide project at Chuquicamata, Chile, is by far the most important. The Chuqui orebody, with more than 1-billion tons of indicated reserves, is the world's largest known copper orebody. (As of 1935, the orebody was officially reported at 1,035-million tons averaging 2.15% copper. Recent mining rate has been about 10 to 12-million tons per year.) The old facilities were for open-pit mining and treatment of oxide copper ore. The new sulphide-ore operation will supplement oxide production and will sustain Chuqui's production at more than 250,000 tons of copper annually. First units of the mill started in May; the smelter will start in July, and full production will begin in early 1953.

IN MINING

Gold Mining Costs Continue To Rise in the Philippines; Premium Prices Necessary if Mines Are To Survive

WILLIAM F. BOERICKE

GOLD OUTPUT in the Philippine Islands in 1951 totaled approximately 406,000 oz. This included about 52,500 oz. of by-product gold, chiefly from the important copper-gold mine, Lepanto Consolidated. Disregarding Lepanto, about 354,000 oz. were recovered by the straight gold mines, mainly from the Benguet-Balatoc operations, Atok-Big Wedge, Mindanao Mother Lode, and Surigao Consolidated.

Since the first of the year, five new gold mines have been added to the list of producers, Itogon Mining Co., San Mauricio, United Paracale, Coco Grove, all old Marsman companies, and Baguio Gold Mining Co., formerly an important independent prewar gold mine in the Baguio area.

The implication would seem to be that gold mining in the Philippines was profitable and bids fair to become more so. This is only half true. It was only because the gold mines had the benefit of an extremely high local gold market during most of 1951 that they were able to make a tolerably good showing. If they had been obliged to sell their output at the statutory price of 70 pesos an ounce ($35) without exception, their operations would have shown a loss, particularly if usual overhead charges were included.

During 1951 the open market for gold in Manila, in which the gold producers are permitted to sell 75% of their output to the highest bidder, varied between a high of 165 pesos and a low of 115 pesos an ounce. The remaining 25% had to be turned in to the Central Bank at 70 pesos an ounce. Speculative demand for gold was keen in the first quarter of 1951 but declined sharply as the year drew to a close. However, the premium market averaged about 126⅓ pesos an ounce for the year, and after allowing for sales to the Central Bank, the mines averaged about 112 pesos. Theoretically, this represented a premium of 60% over the statutory price or the equivalent of a $56 price per ounce. Actually, because the peso in the open market sold at considerably less than the official 2:1 rate, it probably represented a dollar price of about $45 per ounce.

Considerable credit is due the Philippine gold mines for their generally full disclosure of mining costs on their annual reports from which per-ton and per-ounce costs can be readily calculated. Comparison of results in 1951 with 1950 are unfavorable because of higher wages and supply costs that prevailed during the year. This experience, of course, is quite in line with that for most gold mines in other parts of the world. (See table above.)

If depreciation charges were included along with operating cost, which is general in mine accounting in U. S. and Canada whether or not depletion is considered, the cost per ounce would be higher and approach or exceed the statutory price of gold.

In an article published in *E&MJ* in September, 1949, by the writer, entitled "Postwar Operating Costs Higher in the Philippines," it was pointed out that mining costs for three of the four gold mines considered above had increased radically over the last prewar year of operation. The hope was expressed that as tonnage was increased and the mining crews became more efficient after the eight-year war and readjustment period, that unit costs could be reduced, or at least the upward spiral could be halted.

Unfortunately such improvement has not been witnessed. If the provisions of the minimum wage law are followed which call for a minimum of 4 pesos a day after August, the hard pressed gold mines will be in worse straits in the second half of 1952.

Nineteen hundred and fifty-one operating costs have increased from an average of $4.25 per ton achieved in 1940-1 to $11.40 for the four gold mining companies considered, or over 100%. This increase has, of course, eliminated a large tonnage of the estimated ore reserves at the mines and cut down the life of the mines. Thus at the Mindanao Mother Lode mine, the cut off assay used now is 0.35 oz. gold, an increase from 0.3 oz. used in 1949.

With a premium gold market of 100-125 pesos per ounce, the Philippine gold mines can make a reasonable profit. Since the first of this year the price has slipped from 117 pesos an ounce to 100 pesos, but in June it showed a slight imrovement and appears stable at 103 pesos. There is no assurance that the premium market will continue indefinitely but it has existed for eight years since the end of the war and the chances appear good that gold will be in demand in the Far East at more than $35 per ounce as long as hostilities and disorder continue in Korea and China.

Operating Costs of Four Leading Philippine Gold Mines

	Benguet-Balatoc		Atok-Big Wedge		Mindanao Mother Lode		Surigao Consolidated	
	1951	1950	1951	1950	1951	1950	1951	1950
Tons milled	876,521	727,037	171,291	160,747	119,800	111,600	120,453	112,940
Ounces gold produced	194,809	154,399	48,700	52,900	52,000	55,068	42,391	36,292
Ounces gold/ton milled	0.222	0.213	0.284	0.30	0.43	0.56	0.35	0.316
Operating cost/ton	$9.00	$8.06	$8.57	$7.90	$14.50	$13.65	$13.70	$11.50
Increase, percent	12%		8%		6%		20%	
Operating cost/ounce	$40.02	$38.00	$30.15	$26.33	$33.41	$27.68	$35.50	$32.50
Increase, percent	5%		14%		20%		9%	

Costs include mining, milling, development, marketing, general overhead in the Philippines and in U. S. and mine product tax. Costs do not include depreciation, depletion, nor income taxes.

(These properties furnished over 95% of the total gold output of the country in 1951 not including Lepanto's gold production. Costs expressed in pesos have been converted into dollars at 2:1. For Surigao Consolidated, allowance has been made for value of by-products zinc, silver, and lead in making calculations of the per-ounce gold cost.)

Oliver Options Large Area in Ontario

SIGNIFICANT ANOMALIES revealed by aeromagnetic survey have led Oliver Iron Mining Co. (U. S. Steel) to option 5,400 acres of farmland south of the town of Simcoe, Ont., close to Lake Erie. It's too early to even guess how much or even exactly what lies below the surface, but it is an iron ore prospect that definitely warrants drilling. Calculations indicate that the depth of the anomalies is about 3,000 ft. In the event that iron ore is found in character and quality suitable for commercial purposes, several years

Wing-Mounted Magnetometer Explores Brazil

THIS C-47, sitting at an airport in Rio de Janeiro was equipped by Aero Service Corp., with a Gulf magnetometer strutted firmly to the port wing. Elimination of the trailing cable cuts maintenance costs.

RECONNAISSANCE of huge unexplored mineral areas of Brazil is planned with this new-type airborne magnetometer which is mounted on the wing tip instead of on a training cable. Exploration will be performed by a newly formed company, Levantamentos Aerofotogrametricos S.A. (Rua da Alfandega No. 107, Rio de Janeiro) which recently tested this new kind of airborne magnetometer installation on iron ore deposits near Itabirita, about 50 km. from Bello Horizonte in Minas Gerais.

It is expected that the magnetometer will find its first use in exploring big areas of the Brazilian Shield in a search for iron, chrome, asbestos, and various sulphides. It will also be used for general geologic mapping of mineralized areas, and for reconnaissance in promising oil areas such as Sao Paulo and Bahia. The work will be done for the Brazilian Government as well as for private enterprise in

The Levantamentos company is an affiliate of South America's largest aerial mapping organization, Servicos Aerofotogrametricos, Cruzeiro do Sul S.A. Their equipment includes half a dozen Twin Beechcraft mapping planes, 16 jeeps, eight motor boats, mapping cameras, stereoplotting instruments and other equipment.

Aero Service Corp. of Philadelphia has supplied instruments and technical aid and training to these organizations as it has to the Canadian Bureau of Mines and the USGS in the past. Members of Aero's technical staff installed the Gulf magnetometer in the Levantamentos' Douglas plane.

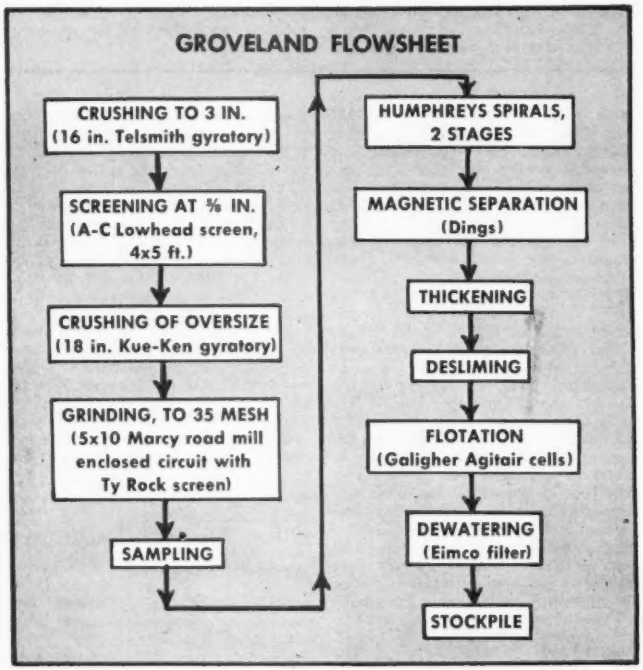
Levantamentos reports these advantages for the wing-mounted magnetometer over trailing cable mounted types:

1. It can be warmed up on the ground and operated immediately after plane take-off. A cable-swung bird must be warmed up aloft.

2. It eliminates electrical and mechanical troubles of the cable. It also eliminates safety hazards of the cable-mounted bird during rough flights.

From a technical standpoint, the wing-tip installation is expected to reduce maintenance work, and it is further expected that the unit will improve quality of magnetic record, already dependable to one or two parts in 50,000.

Homer Jensen, chief of the Magnetometer Division, Aero Service Corp., points out that the airborne magnetometer has been useful in regional mineral surveys in Canada, United States, Cuba, Venezuela, Union of South Africa, as well as in oil studies in Alaska, the Bahamas, Mozambique, India, and Tunisia; and that this great body of operational and interpretive experience should make the geophysical instrument useful in Brazil right from the start.


GROVELAND FLOWSHEET
CRUSHING TO 3 IN. (16 in. Telsmith gyratory)
SCREENING AT ⅝ IN. (A-C Lowhead screen, 4x5 ft.)
CRUSHING OF OVERSIZE (18 in. Kue-Ken gyratory)
GRINDING, TO 35 MESH (5x10 Marcy road mill enclosed circuit with Ty Rock screen)
SAMPLING
HUMPHREYS SPIRALS, 2 STAGES
MAGNETIC SEPARATION (Dings)
THICKENING
DESLIMING
FLOTATION (Galigher Agitair cells)
DEWATERING (Eimco filter)
STOCKPILE

Groveland Handles 33% Iron Ore

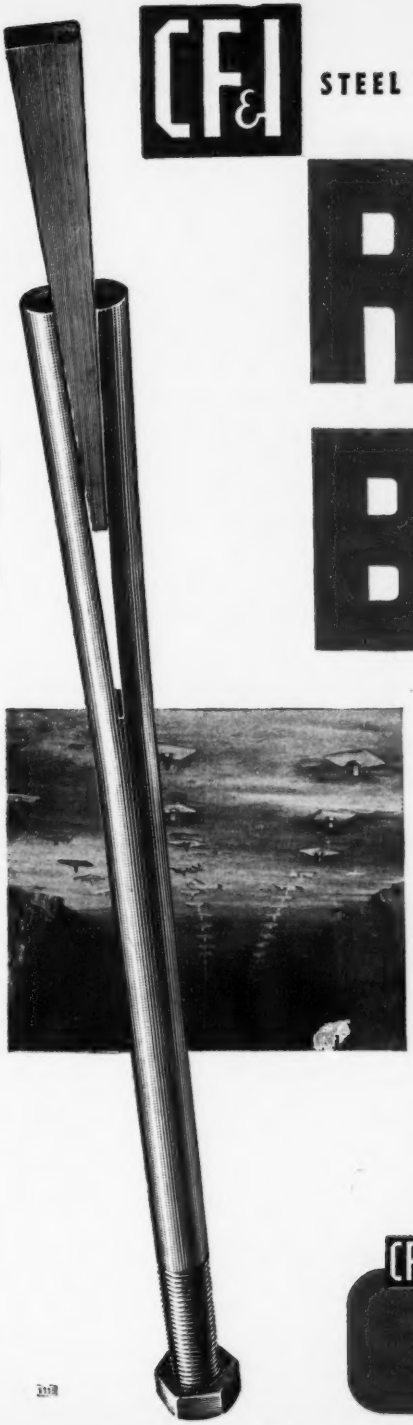
HERE IS THE BASIC flowsheet of Hanna's Groveland plant near Randville, Mich. The plant is arranged so that several combinations of circuits can be tried before deciding definitely on the final flowsheet.

The plant is treating 25 tph of crude ore running about 33% iron. Some 5 tons of water are required for each ton of ore, although much of the water is recovered for reuse. Groveland is operating six days a week.

CF&I

STEEL PRODUCTS FOR THE MINING INDUSTRY

ROCK BOLTS



This modern means of mine roof or wall support provides greater safety, economy and better housekeeping... here's why:

- Support is furnished within a few inches of the face or heading. Blasting has little or no effect on the bolts.
- More clearance is provided overhead and on the sides.
- Ventilation is improved by the elimination of crossbars and posts.
- Bolts store in less space... handling and transportation costs are reduced.
- Less installation work is required than for timbering.

Investigate the use of CF&I Rock Bolts for your own mining operation. Write for additional information.

CF&I Products for the Mining Industry

Cal-Wic Wire Cloth Screens • Mine Rails and Accessories
Rock Bolts • Wickwire Rope • Grinding Balls
Grinding Rods

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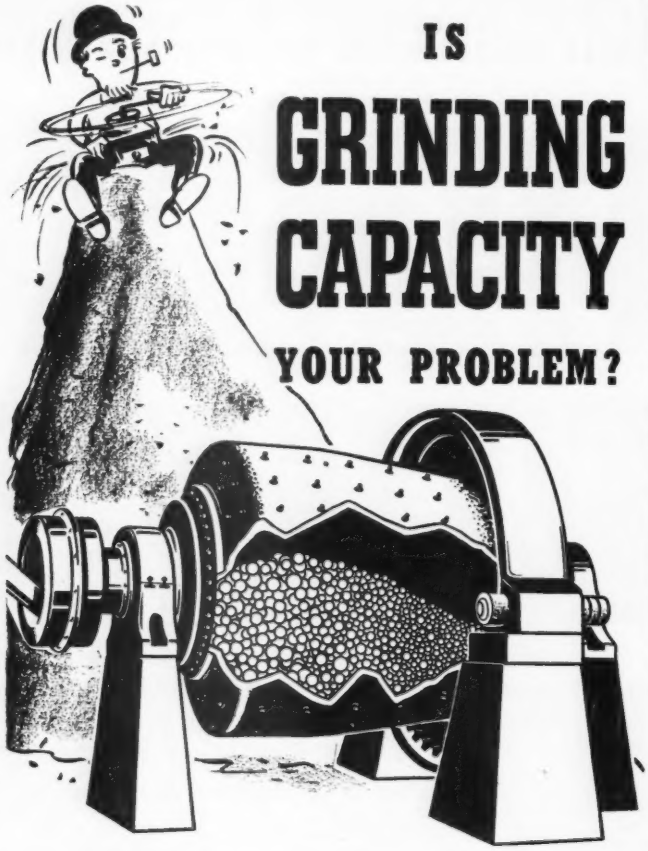
THE COLORADO FUEL AND IRON CORPORATION, DENVER AND NEW YORK

CF&I
ROCK BOLTS
THE COLORADO FUEL AND IRON CORPORATION



IS

GRINDING CAPACITY

YOUR PROBLEM?

HARDINGE TRICONE MILLS

Here are some of the reasons why the Hardinge Tricone Mill is more efficient than other mills:

1. The tapered barrel causes correct ball alignment. Grinding energy is conserved thereby. Ball consumption is reduced, the big fellows are kept away from the little ones.
2. The Tricone Mill occupies less floor space for a given grinding volume than any other type of mill ever built.
3. New design bearings reduce friction and cut over-all power consumption about 5%.
4. When crowded for more capacity, a grate is added, at a proportionate increase in power, but with this type of grate mill, the larger balls are kept at the feed end, and only smaller balls are in contact with the grate, which minimizes wear.
5. Tapered ends reduce end friction, as is evidenced by lower liner consumption and power.
6. Ideal for large tonnages.

Write for Bulletin AH-414-1

See Branch Offices on Opposite Page

HARDINGE

Your Digest of Annual Reports

NEW CALUMET MINES, LTD. produced and milled a record 259,214 tons at its operation on Calumet Island, Que. (Year ending Sept. 30, 1951). Operating profit was up to $2.0-million from $1.7-million the previous year.

Reserves (in place) at the end of the period were 927,285 tons averaging 6.7% zinc, 1.6% lead, 3.23 oz. silver, and 0.017 oz. gold.

A new production shaft, designed to open up an area below the 1,500-ft.

MAGMA COPPER CORP. produced from its Magma Mine, Superior, Ariz., and sold $11.9-million in copper, gold, silver, and zinc for a net profit of $1.9-million. (Magma paid no federal income or excess profits taxes in 1951 because it turned in a consolidated income tax return with San Manuel—where developments expenditures were heavy.)

Ore Production, Magma Mine

Type Ore	1,000s Tons	% Cop.	% Zinc	Oz. Sil.	Oz. Gold
Copper	307	5.68	—	1.03	0.30
Zinc	118	1.25	7.71	2.64	0.016
Total	425	4.45	—	1.48	0.026

Metal Production, Magma Mine

Copper Tons	Silver 1,000s Oz.	Gold 1,000s Oz.	Zinc Conc. Tons
18,467	491.2	11.0	12,628

About one year's production of zinc ore remains. However, **in the far east area**—about 2,000 ft. east of the current mining limit—the company continued to explore **some very encouraging bedded copper** ore on the 3,000 and 3,400 levels at the bottom of the Martin limestone.

San Manuel reserves were extended, by drilling and drifting, to this total:

Type	Tons	% Copper
Oxide	111,876,000	0.72
Sulphide	367,624,000	0.79
Total	479,500,000	0.77

No. 1 shaft has been sunk to 1,643 ft., and will not be sunk deeper until after production starts. No. 2 shaft was completed to 2,068 ft., and sinking buckets and equipment have been replaced with skips, cages and skip dumps. A concentrator flowsheet has been determined; it is simple, follows standard practices, and provides good recovery at low cost.

NATIONAL LEAD CO. hit a new high in sales, $390-million, for a second high in net income, $23-million.

Big additions to the company's account of plants were increases in the titanium pigment plant capacity at Sayreville, N. J. and St. Louis, Mo.

Titanium Metals Corporation of America is jointly owned by National

Lead and Allegheny Ludlum Steel Corp. At Henderson, Nev. this company, in mid-1951, announced that it was building for the government the first large-scale self-contained titanium metal plant. First production was in Oct., 1951, and production and construction will continue until an output of 10 tons per day is reached late in 1952. Among proposed uses for titanium, the company lists **aircraft landing gear**, propellers, fire walls, armor, skin and internal-combustion parts; jet-engine parts such as complete compressor section and after-burners; **chemical processing equipment** (in many instances, it is the only metal capable of withstanding service conditions); marine use; and **ordnance, including armor.**

The Atom. National Lead is contract-operator of the feed materials production center now under construction near Cincinnati, Ohio. This plant will include a refinery for uranium ore, and other facilities for production of uranium in forms AEC can use. It will eventually have in excess of 1,200 employees.

Nickel Processing Corp. now operating the Nicaro plant, Oriente Province, Cuba, is a joint venture between National Lead, Tin Processing Corp., and Cuban interests.

A cobalt plant at Fredericktown, Mo., is scheduled for completion about mid-1953. It will also recover nickel and copper.

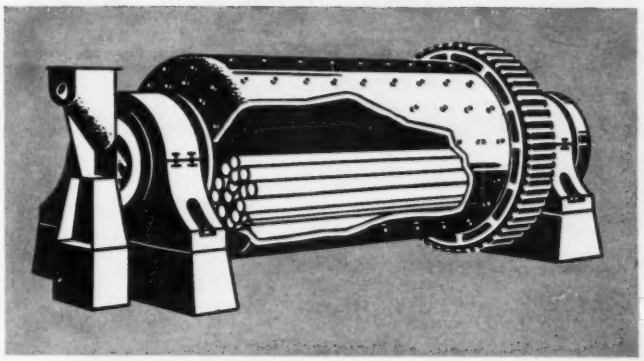
NEWMONT MINING CORP. grossed $11.0-million (largely in dividends and capital gains from stock held in other companies) and showed a net of $8.1-million.

Societe Nord-Africaine du Plomb in Algeria, close to the Moroccan boundary, is 31.85% owned by Newmont. "From shaft N-3 a drift extending easterly has disclosed at a depth of about 870 ft. below surface, an unusually rich run or elongated flat-lying zinc orebody, which is 30 to 35 ft. thick, approximately 150 ft. wide, and as far as developed (approximately 1,300 ft.), appears to carry about 18% zinc and 2% lead. It is expected that production from this orebody will be started in the current year."

Societe des Mines de Zellidja started its new mill in June, 1951. Upon completion of the third section in May, 1952, the capacity will be more than 4,000 tons of ore per day. Newmont's share interest is about 3%, but it will derive substantial revenue for technical and general assistance.

O'okiep Copper Co. Ltd., Union of South Africa, established new records during the fiscal year ending June 30, 1951. Metal sales ex mine were $12.9-million from 22,702 short tons of copper for a net profit of $5.7-million. Capacity of the O'okiep mill is being increased 50% in 1952. A

IS SIZE REDUCTION YOUR PROBLEM?



HARDINGE ROD MILLS

Hardinge's recent bulletin on Rod Mills answers the question—What Happens Inside a Rod Mill?—and shows how Hardinge Rod Mills solve some of the usual problems.

- Hardinge Rod Mills efficiently prepare products in the 6-mesh to 20-mesh range in open circuit, both wet and dry grinding.
- When used in closed circuit producing similar, closely sized products, performance compares favorably with best obtainable by other means.
- Conical heads in Hardinge Rod Mills reduce friction, prevent congestion of charge at the ends, and align the rods.
- Hardinge Rod Mills are built in sizes from 2' to 11½' diameter in variable lengths for the job to be done.
- Hardinge Rod Mills are built with either end, or center, peripheral discharge, or with trunnion overflow.

• Write for Bulletin 25-C-1

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Annual Reports (*Continued*)

fourth chamber is being added to the acid plant at Nababeep leaching plant.

Sherritt Gordon Mines Ltd. is working toward a schedule of mining and processing 2,000 daily tons of nickel-cobalt-copper ore by the latter part of 1953.

Geophysical Development. The search for new mines continued to be a primary objective. "In annual reports submitted for 1949 and 1950, mention was made of the efforts . . . to develop a geophysical tool capable of really diagnostic information as to the occurrence of nonferrous ores in the extensive covered areas of the western mining states. This effort has been at least partially successful. Drilling of areas, determined by this means to carry metallic sulphide, has been initiated and will be prosecuted during the current year."

ST. JOSEPH LEAD CO.'s production of lead was down from 1950, but zinc production was up:

	1950	1951
Lead Conc.	169,354	158,579
Pig Lead, in Conc.	110,928	102,391
Pig Lead, Total ..	141,595	112,754
Zinc Conc.	75,290	82,217
Sulphuric Acid ...	157,036	156,861
Zinc, Total	98,443	99,602

Lead production was down about 8%, although ore tonnage was highest in history. Reasons: Lower grade ores, and necessity for additional development and construction.

Zinc production was up, largely because of increased output from Balmat-Edwards and Josephtown.

Sulphuric acid output was down because of inability to get sulphur.

Balmat and Edwards. This division produced 77,742 tons of zinc concentrates as against 72,548 in 1951. The new 875-ft. shaft for northern orebodies was completed, and Balmat mill capacity was increased from 200 to 1,800 tons of ore daily. Underground development will be finished in early 1952. Ore development at Balmat and in depth at the 400-ton-per-day Edwards has been "most encouraging."

Leadridge Mining Co., 100% owned by St. Joe, will spend at least $100,000 prior to Nov. 1, 1952 on exploration of a uranium-bearing concession, 12.5-mi. by 3-mi. in the Beaver Lodge Lake area of Saskatchewan.

In Morocco, the 1951 progress at Zellidja has resulted in milling of 3,500 tons of lead-zinc ore daily. At adjoining Nord Africaine du Plomb, 17.5% St. Joe's, "ore developments were so encouraging that steps are now being taken for production as rapidly as conditions will permit."

Hayden Creek, Washington County, and Herculaneum, Mo. projects are somewhat behind schedule but may be completed in 1953.

In its report to employees, St. Joe states sadly that "authorization was given by the Argentine authorities to convert only 991,729.16 pesos of the 11,160,000-peso dividend into $69,573.90 U.S. dollars." This statement concerns the Aguilar mine, where "the impossibility of obtaining sufficient permits for foreign exchange and the resultant lack of spare parts, mine and mill supplies are having a very adverse effect . . ."

SHATTUCK DENN MINING CORP. Total metal and fluorspar value for 1951 was $6.0-million, for a net profit of $0.84-million.

Production

Ore (own & custom)	242,775 tons
Zinc	15,725,624 lb.
Lead	5,929,653 lb.
Copper	202,586 lb.
Gold	19,815 oz.
Silver	605,528 oz.
Fluorspar	16,060 tons

Fluorspar production of the company's Zuni Milling Co., New Mexico, was up substantially from 1950. The main product, acid-grade fluorspar, went to the aluminum and chemical industries.

Zinc-lead ore came mainly from the 10th and 11th levels of the Iron King mine, Humboldt, Ariz. The 12th and 13th levels are being prepared for

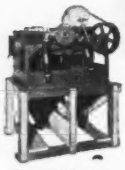
Denver-Dillon Vibrating Screens

Denver Ore Feeders

Denver Steel-Head Ball Mills

Denver Disc Filters

DENVER FORCED FEED Jaw Crushers


Denver Selective Mineral Jigs

Sizes:

(Type "H"—anti-friction bumper bearings, bronze side bearings.)

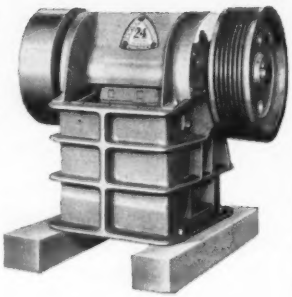
2¼" x 3½"	8" x 10"
3¼" x 4½"	10" x 16"
5" x 6"	10" x 20"

Denver SRL Pumps

Sizes:

(Type "J"—anti-friction bearing crusher.)

10" x 24"	18" x 36"
10" x 36"	21" x 36"
15" x 24"	21" x 40"
15" x 36"	25" x 40"
18" x 24"	32" x 40"



Denver-Buckman Concentrators

Specifications: Cast steel or fabricated steel frame. Cast steel bumper. 13%-14% Manganese steel jaws and cheek plates. Forced Feed crushing action. Safety toggle of cast iron protects against tramp iron.

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extraction, stations are cut on the 14th and 15th, and the company is preparing to sink a new shaft, the No. 7, to a depth of 1,867 ft. for production from deeper levels.

TEXAS GULF SULPHUR CO. grossed $71.7-million from sulphur sales for a net income after taxes of $25.4-million. Production was at a new peak, but was still not enough to meet demand.

Moss Bluff, Texas mine showed a marked production improvement during the year.

At Spindletop Dome, near Beaumont, Tex., construction of an operating plant is nearing completion and may be in production before July, 1952.

TONOPAH MINING CO. OF NEVADA reports that old workings at the Rosita copper mine in Nicaragua were cleaned out and sampled during 1951. Laboratory tests on the samples are now being made to determine the chances for a profitable operation of the property. Tonopah Mining holds a 40% interest in Tonopah Nicaragua Co., which in turn owns the Rosita.

UNITED STATES SMELTING REFINING & MINING CO. grossed $40.2-million for a net gain (profits plus inventory and investment gain) of $6.4-million. Production from company properties and custom ores (excepting those on toll basis) follows:

	1950	1951
Gold, Oz.	202,806	180,312
Silver, Oz.	2,393,998	2,729,546
Lead, Tons	36,515	39,469
Zinc, Tons	21,691	28,675
Copper, Tons ..	979	1,195
Oil, Bbls.	60,808	188,932

During the year, the company acquired several properties in Utah: Ohio Copper Co., 115 acres of patented claims; United Bingham Copper Co. and Bingham-Congor Copper Co., 398 acres near the company's U. S. and Lark mines.

The report contains a summary of a **long-range program** to acquire interests and leases in **oil properties,** and to put them into production. This program started in 1947, with acquisition of sub-shares in Texas Pacific Land Trust—the company sold 30,000 of its 105,100 sub-shares this year at a listed gain of $1.9-million after deducting a loss sustained on Ebner Gold Mining Co.

The company started a study of the **Williston Basin** in 1949, added substantially to holdings there in 1951 after discovery of oil in April, 1951, and as of December 31, held an effective interest (gross acres times percentage held by U. S.) of 646,200 acres in the Basin. The company also had 664,900 acres in west Texas and New Mexico.

MINING CORPORATION OF CANADA, LTD., made a net profit of $2.7-million compared to $1.4-million in 1950. The increase was due largely to dividends from Quemont. (Mining Corp. operates largely through holdings in subsidiary corporations.)

Exploration. The company's crews found favorable mineralization under promising geological conditions in a 15.7-sq.-mi. concession in the Waddy Lake area of Saskatchewan; considerable work is planned for 1952. In the Rocky Brook Millstream Area, New Brunswick, the company optioned 6¼ sq. mi. adjoining a lead-zinc discovery; prospecting and surface work are scheduled for this summer.

NORMETAL MINING CORP., LTD. made a net profit of $2.8-million, down from $3.2-million in 1950. At its mine near Noranda, Que., the company hoisted and milled 359,000 tons of ore averaging 2.26% copper, 7.41% zinc, 0.027 oz. gold, and 2.48 oz. silver. From this it produced 32,410 tons of copper concentrate (21.70% copper) and 42,497 tons of zinc concentrate (50.25% zinc). Contained metal was 14.1-million lb. of copper, 42.7-million lb. of zinc, and 446,723 oz. silver.

Reserves (before dilution) on Jan. 1, 1952 were 2.4-million tons averaging 2.67% copper and 8.32% zinc.

A new plant to produce approximately 175 daily tons of pyrite was scheduled for completion in March, 1952.

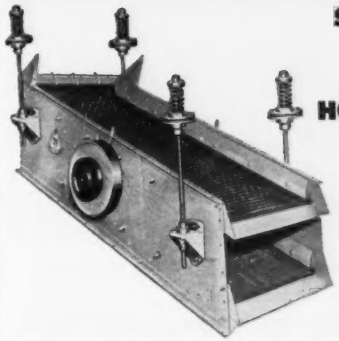
Denver "Sub-A" Flotation

Denver Cross-Flow Classifiers

Denver Hydroclassifiers

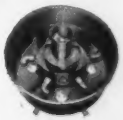
Denver Super-Agitator and Conditioners

DENVER-DILLON Vibrating Screens



SAVE UP TO 50% HORSEPOWER

Denver Reagent Feeders


Denver Pulp Distributor

Denver Thickeners

Denver Jaw Crushers

Notice, on Denver-Dillon Vibrating Screens, that bearings are not anchored to heavy channel iron or other supports. Weight of screen and load is suspended. Bearings support only weight of flywheels and shaft. Screen is free of restrictions to impart maximum vibration to entire screen body.

You save on initial cost, too, for this patented action eliminates unnecessary weight and fabricating costs.

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IN THE UNITED STATES

ALASKA

★**Contracts totaling $295,676** have been awarded by DMEA to three Alaska mining firms which will put up $62,558. The largest amount, $133,676 goes to Alaska Metals Mining Co. for work on a tungsten property in the Fairbanks area where an estimated 2,000 tons of ore a day is expected. The company's share will be $44,558; $108,000 goes to Admiralty-Alaska Gold Mining Co. for work on a nickel-cobalt property on Admiralty Island in the Juneau area. The company's share is $12,000. Zenda Gold Mining Co. will receive $54,000 for work on a tin property in the Tin City area, on Seward Peninsula near Nome, with the company's share being $6,000. A dredge used for gold mining near Fairbanks will be dismantled and brought to Circle for the work.

★**Erickson Placers, Inc.,** will start its scheelite-tungsten mine northwest of Nome this season.

★**After a 10-year shut down** gold dredging operations at Livengood were revived last year by Callahan Zinc Lead Co., which dug 786,641 cu. yd. The RFC owns the properties and the Callahan company has submitted plans for this season's operations.

★**Increased production** this season is planned in the chromite claims owned by Mike E. Siler, at Red Mountain. Plans are for negotiating a contract with DMPA to purchase chromite.

★**Production by U. S. Tin Corp.** is not far off at its Lost River property on Seward Peninsula, where the company has operated continuously since last July with an average of 12 white men and 40 Eskimos employed. A remarkable piece of work is reported to have been done under the general superintendent, Paul M. Sorensen. Buildings left since 1917 have been rehabilitated, a 400-ft. tunnel cleaned, a 200-ft. shaft sunk, a new mill-access tunnel bored, a 100-ton pilot plant built and housing for 100 people erected.

★**Fairbanks Exploration Co.** opened its operations at Dome Creek camp late in April.

★**Alaska Juneau Gold Mining Co.** which has not operated since 1944 is reported to have paid $1,500 for 19 patented lode claims or 216 acres to the west of its property at Juneau. This may avoid possible trouble over apex rights if and when mining is resumed on lower levels of the mine. According to G. A. Norris, president, power sales in 1951 amounted to $133,140 and a net loss of $90,708, compared with sales of $122,493 and a net loss of $88,381 in 1950.

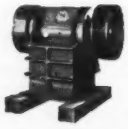
★**The Geophysical Institute** of the University of Alaska will hold discussion meetings during the summer, usually on the first and third Wednesdays at four o'clock. These will be open to the public in the conference room at College. Staff members will discuss or give papers concerning their special work.

★**According to Art Glover** of the Territorial Department of Mines office at Ketchikan the uranium ore on Prince of Wales Island is "low grade," but might prove commercially valuable. The radioactive mineralization has been found on the northeast coast of the island. Mr. Glover believes intensive prospecting is fully justified.

★**Exploration work will continue** this season at Native Bismuth, Inc.'s property on Charley Creek, north of Nome, where the adit will be extended to 500 ft. with two 40-ft. crosscuts out from the adit. At 5-ft. intervals channel cuts will be made for assays. Plans call for sinking about 200 ft. on the best ore shoot. The mine consists of six lode claims and five placer claims. A highway from Nome extends within 12 mi. of the mine and from there, a 12-mi. tractor trail goes in. An adit was driven 54 ft. along the strike of the vein last season and 13 crosscuts were made.

Denver-Dillon Vibrating Screens

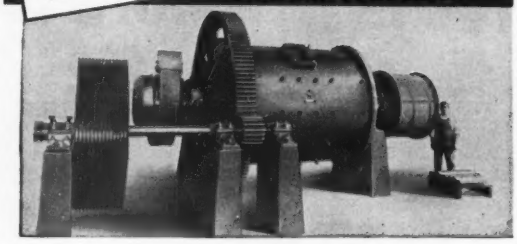
Denver Ore Feeders


Denver Jaw Crushers

Denver Disc Filters

Denver Selective Mineral Jigs

DENVER the Ball Mill with STEEL HEADS



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Mill men know that replacement cost
is small *compared to losses caused by mill shutdown!*

Denver-Buckman Concentrators

Steel heads on DENVER BALL MILLS put *strength* where it is needed. Repeat orders from mills all over the world prove dependability of Denver Steel Head Ball Mills. A Denver Steel Head has never failed!

SIZES: Diameters of 12" - 16" - 24" - 30" - 36" - 48" - 60" and 72" in lengths up to 12 feet.

Please write to us about your requirements. Quantity production of standard DECO equipment means lower cost and good deliveries.

Complete mill equipment from testing...to feeder...to dryer.

DENVER "SUB-A" FLOTATION
—for 25 years the greatest name in Flotation Engineering.

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ARIZONA

★**Eight aeromagnetic maps** made over central and southern Arizona by the U. S. Geological Survey have been placed in the Arizona Bureau of Mines at the University of Arizona, Tucson, for public inspection. The maps cover approximately 2,100 sq. mi. of Cochise, Dragoon, Globe, and Mammoth quadrangles; parts of Camelback, Phoenix, Mesa, Cortaro, Fisher Wells, and Willcox quadrangles; and the Bagdad and Jerome-Prescott areas of Yavapai County.

The maps are not available for distribution or sale. Their purpose is to aid in the location of geological features beneath ground surface.

★**Phelps Dodge Corp. received a low** bid of $700,000 for construction of an earth and rock-fill dam across Show Low Creek 4-mi. south of Show Low in northeast Arizona. Isbell Construction Co. of Phoenix submitted the bid for the project designed to stabilize the water supply for mining operations at Morenci. The dam will be 80 ft. high and back up a mile-long lake.

The purpose is to trade this water to the Salt River Valley Water Users Association for additional water out of Black River.

The Black River water will be piped into the Eagle Creek watershed and pumped out again at Morenci.

★**Robert G. Page,** Phelps Dodge president, inspected company holdings in Arizona and expressed pleasure in development of the new Lavender pit at Bisbee. Between 40,000 and 50,000 tons of rock are being moved every day, 26 days out of 28.

CALIFORNIA

★**Gypsum deposit** in northeast San Bernardino County, has been reported on eight unpatented claims located in 1946 belonging to D. H. Shire. Assessment work has just been completed and additional development will be needed to determine the character of the deposit. Most of the gypsum is low on talus-covered southwest side of the wash.

★**Open cut tungsten mining** began in April at the Princess Pat mine about 8 mi. northwest of Adelanto, San Bernardino County. About 100 tons have been shipped to the Jaylite mill. Ore is scheelite in dolomitic rock adjacent to a dioritic intrusion.

★Construction of an 8.5-mi. access road west from abutment of Shasta Dam to the Friday-Lowden copper mine on west shore of Shasta Lake is nearer reality with an agreement between Redding Board of Supervisors and the Bureau of Reclamation. The County has agreed to build the $900,000 road and is being reimbursed on a monthly basis by the federal agency. Road will provide access to mines which became isolated when the lake covered existing roads.

★**Unusual mixture** of mining and meat was the choice of the Central Eureka Mining Co., gold producer on Mother Lode, which has acquired assets and properties of Kaufmann Meat Co. of San Jose to diversify activities and improve sources of income.

Central Eureka President Donald D. Smith said that Kaufmann Meat will be acquired through exchange of about 500,000 shares of the mining company's capital stock. Net worth of Kaufmann Meat is estimated at $800,000. Central Eureka will become the parent company. The mining company also acquired leases and options on three Arizona copper properties two years ago and a subsidiary is engaged in lumber business in Amador County.

★**Holiday properties** on the west fork of Patricks Creek, 22 mi. northeast of Crescent City, report resumed production of high-grade chrome ore. Holiday Mining Co. controlled by local businessmen, shipped 400 tons of ore averaging higher than 45% chromic oxide to government purchasing depot at Grants Pass, Ore. last fall, and expects to triple production rate this summer.

★Alonzo Mining & Milling of Manila,

Denver "Sub-A" Flotation

Denver Cross-Flow Classifiers

Denver Hydroclassifiers

Denver Super-Agitator and Conditioners

DENVER Mineral Jigs

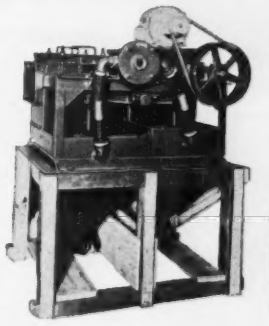
Recover Your Minerals as soon as Free

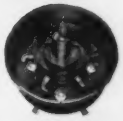
Denver Reagent Feeders

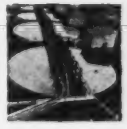
Gravity concentration *in grinding circuits* is now possible. Denver Selective Mineral Jigs treat an unclassified feed and recover minerals as soon as free and at a coarse size.

Prove to yourself the advantages of recovering mineral as soon as free *and before you grind H---* out of it! Send a 100 pound sample of ball-mill feed and $30.00 to: Denver Ore Testing Laboratory, Denver 17, Colorado. Please sketch present flowsheet and give tonnage. Products of Denver Jig Test will be returned to you for assay. If you are not satisfied there will be no charge. You are the judge.

Tests of this nature have discovered amazing recoveries that reduced over-all milling costs.




Denver Pulp Distributor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Many of our machines are in stock

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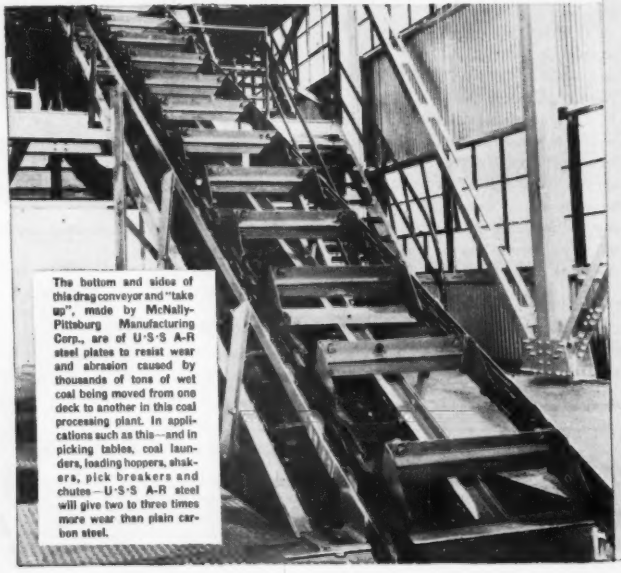
3 profit-making reasons

why your equipment should be built

By the use of U·S·S COR-TEN steel, this 28½ cubic yard dump trailer built by Trailmobile Co. was made stronger and more resistant to corrosion. But what's more, its weight was reduced by 1,000 pounds. That means it can haul 1,000 pounds more payload without any increase in loaded weight over a similar unit built of ordinary steel. And the extra cost for all of this? Only thirty dollars!



The bottom and sides of this drag conveyor and "take up", made by McNally-Pittsburg Manufacturing Corp., are of U·S·S A-R steel plates to resist wear and abrasion caused by thousands of tons of wet coal being moved from one deck to another in this coal processing plant. In applications such as this—and in picking tables, coal launders, loading hoppers, shakers, pick breakers and chutes—U·S·S A-R steel will give two to three times more wear than plain carbon steel.

U·S·S COR-TEN STEEL

U·S·S COR-TEN is a ductile, low-carbon chromium-nickel-silicon-copper-phosphorus steel having a minimum yield point, in thickness of ½" and under, of 50,000 psi—at least one and one-half times that of structural carbon steel.

It has a minimum tensile strength of 70,000 psi in these same thicknesses. Its resistance to abrasion, shock and impact is superior to that of structural carbon steel; its fatigue resistance—that is, its ability to withstand vibration stresses, is 60% greater.

What particularly distinguishes U·S·S COR-TEN steel is its unusually high resistance to atmospheric corrosion—4 to 6 times that of plain steel, 2 to 3 times that of copper steel. It is this property that helps to assure the safety, long life and low maintenance cost of any equipment in which COR-TEN steel is used to obtain greater durability, or in lighter thicknesses to reduce weight.

U·S·S COR-TEN steel is produced in all standard products—plates, shapes, bars, sheets, strip, special cold formed sections, wire and tubular products. It is recommended particularly in light and intermediate thicknesses.

U·S·S TRI-TEN* STEEL

This manganese-nickel-copper steel has a yield point of 50,000 psi min. and a tensile strength of 70,000 psi min. in thicknesses ½" and under, with moderately lower values as thickness increases to a maximum of 4". It has superior toughness and ability to withstand shock at sub-zero temperatures. It has greater resistance to abrasion than structural carbon steel (ASTM A7) and its fatigue resistance is 50% higher. U·S·S TRI-TEN steel's resistance to atmospheric corrosion is slightly superior to that of copper steel.

Because U·S·S TRI-TEN steel has very good welding properties in intermediate and heavier thicknesses, this grade is particularly recommended for application in heavy-duty equipment, such as illustrated (right), where maximum ruggedness and strength with minimum weight are prime requisites.

U·S·S TRI-TEN steel is produced in plates, structural shapes, bars and bar shapes.

**During the present critical shortage of nickel, an emergency manganese-copper-vanadium grade, identified as U·S·S TRI-TEN "E" steel is being produced in place of U·S·S TRI-TEN steel. It has equivalent engineering values and its use is recommended in place of U·S·S TRI-TEN steel.*

U·S·S A-R STEEL

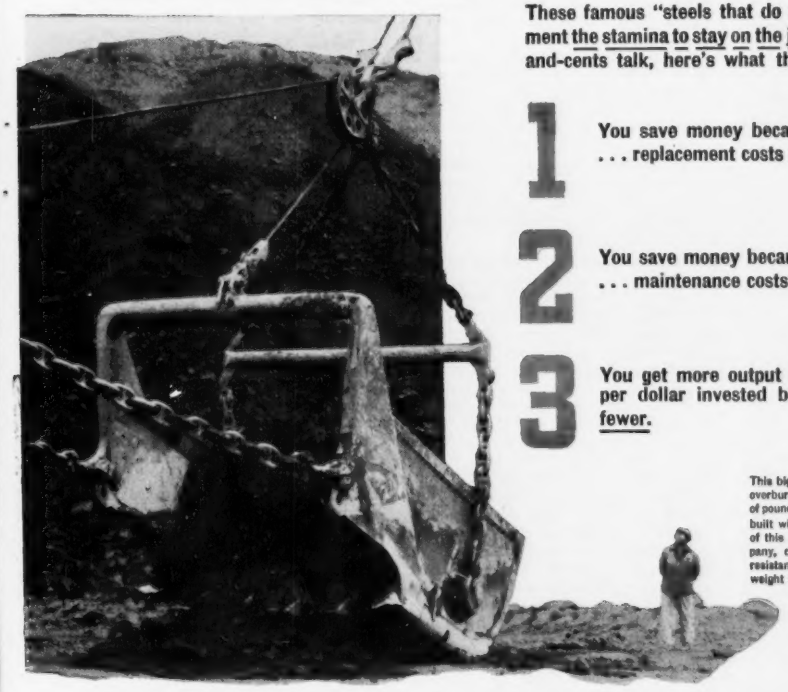
Here is a low-cost, abrasion resisting steel that was developed especially to meet the needs of the mining and other materials handling industries.

U·S·S A-R is an intermediate carbon-manganese steel, with better workability than plain carbon steel of the same hardness level. Its surface hardness ranges from 200 to 250 Brinell.

A-R steel has many applications in the mining field. Its use has decreased the number of breakdowns and lengthened the life of such equipment as chutes, buckets, conveyors, screens, picking tables, separators, loading booms, skid plates, etc.

U·S·S A-R steel is available in strip, sheets, universal mill plates, sheared plates and bars and bar shapes. It can be machined, drilled, sheared, punched, welded and hot and cold formed, although certain precautions and special equipment are sometimes necessary because of the product's exceptional hardness.

with U·S·S High Strength Steels



These famous "steels that do more" give your equipment the stamina to stay on the job. And in plain dollars-and-cents talk, here's what that means to you. . . .

1 You save money because equipment lasts longer . . . replacement costs are lower.

2 You save money because less servicing is needed . . . maintenance costs are lower.

3 You get more output (and therefore more profit) per dollar invested because work stoppages are fewer.

This big baby can scoop up 30 cubic yards of coal or overburden in one bite. That means it has to take a lot of pounding and grinding. And it can . . . because it was built with U·S·S TRI-TEN steel. The manufacturer of this king size dragline bucket, Bucyrus-Erie Company, chose TRI-TEN steel to obtain high impact resistance at low temperatures, high tensile strength, weight reduction and improved welding qualities.

WITH these famous high-strength steels; U·S·S COR-TEN, U·S·S TRI-TEN, and U·S·S A-R, abrasion resisting steel, all parts ordinarily prone to fail can be made highly resistant to wear, fatigue, abrasion, atmospheric corrosion and shock. You get maximum strength and durability, and therefore maximum use from your equipment.

But that's not all!

U·S·S High Strength Steels have a yield point 50% higher than that of ordinary structural steel. That means you can increase the strength of parts *without increasing weight*. Or, you can use one of these steels in lighter sections to *reduce* weight without reducing your present level of strength. In either case, a substantial saving in steel may result.

For 17 years, our engineers have cooperated with the mining industry in applying U·S·S High Strength Steels. They'll be glad to show you how these tougher, stronger, more durable steels can be applied to give your equipment the stamina to stay on the job.

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U·S·S HIGH STRENGTH STEELS

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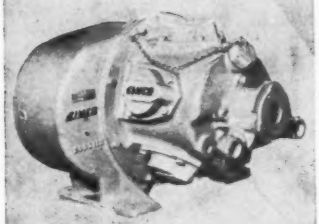
EIMCO
Geared
AIR MOTORS



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All gearing, shafts, and bearings are designed to work under peak loads for long intervals.

The power unit is an Eimco five cylinder radial type reversible air motor. This high starting torque motor will work efficiently on air pressures from 40 to 125 p.s.i.

Eimco geared motors are available in three sizes, from 7½ to 17 h.p., each with four different speed ratios. Write for complete information.

Eimco power means dependability!

EIMCO
THE EIMCO CORPORATION

California *(Continued)*

P.I., has started to build an asbestos processing plant near Hollister. Treatment of about 100 tons per day was expected to start in the middle of July.

IDAHO

★**Nevada Stewart Mining Co.** has started diamond drilling from the main tunnel of old upper workings on its property in the Pine Creek area to locate an orebody first disclosed by a United States geological survey in 1943. Drilling by the USGS intersected commercial grade ore over a strike length of about 400 ft. extending from 150 to 350 ft. below the surface. The orebody contains an estimated 25,000 tons averaging about 11% combined lead and zinc. Present work from the main tunnel level, will, if successful, intersect the ore near the lower limit indicated by USGS work.

★**Development of the New Purim area** of the silver belt, between the Sunshine and Silver Summit mines, got under way, following completion of a five-company agreement consolidating the ownership of the area and providing for sharing of costs and profits.

The five participating companies in the new deep development project are Polaris Mining Co. (23.76%); Silver Summit Mining Co. (9.855%); Silver Dollar Mining Co., Lincoln Mining Co. (30.331%); and Hayden Hill Consolidated Mining Co. (36.054%). Silver Dollar has a long term lease on Lincoln and Hayden Hill properties.

The area, which contains the westerly extension of the vein now being mined by Silver Summit, will be opened from the 3,000-ft. level of the Silver Summit mine, with Silver Summit as the operating company.

Silver Dollar has already explored the Purim sector from its 1,800-ft. level and has exposed a strong mineralized vein with rich silver ore in several places. At this elevation, however, the amount of ore is insufficient for a commercial operation.

★**American Smelting and Refining Co.** has completed the big shaft repair and surface plant expansion program at its Vulcan-Galena deep development project on Lake gulch west of Wallace. The company has resumed development work on the wide zone of mineralization exposed in the south crosscut on the 3,000-ft. level.

The property, owned by the Vulcan-Silver-Lead Mining Company, Callahan Zinc-Lead subsidiary, and being developed by Asarco under a profit-sharing lease agreement, is now equipped with a 900-hp. hoist and will soon have substantially greater compressor capacity. A large new mining operation in the district is indicated if the encouraging initial exposure proves up to expectations.

Also under way is a surface exploration crosscut on the Silver Buckle Mining Co. property which adjoins Vulcan Silver-Lead ground. Asarco has an option to acquire a 67% interest in Silver Buckle.

★**New Rainbow Mining Co.** has resumed development work in the lower workings of the old Weber mine near Lakeview, Idaho, after a brief winter shutdown. About 700 ft. of the 1,700-ft. lower tunnel remains to be cleared to permit access to the downward extension of an orebody from which regular shipments of silver ore have been made for the past several years.

★**Clayton Silver Mines'** property in the Bay Horse district has been closed by a strike. Employees are demanding the same wage scale as that paid in the Coeur d'Alene mining district. This is $1.02 per day more than they have been receiving.

★**Sun Valley Lead-Silver Mines** has stepped up development work at its Blue Kitten property in the Warm Springs district, by putting on a second shift in the new lower tunnel. Daily advance is now about 9 ft. Ore objective of the work is the downward extension of an orebody which has been opened and developed in the No. 1 tunnel above.

★**Sunshine Mining Co.** is exploring along the Big Creek fault in Metropolitan Mines corporation ground. The fault, a major geological structure in the Coeur d'Alene district, was intersected at depth for the first time early last month in the company's 3,100-ft. level south exploratory crosscut into Metropolitan ground. It was encountered 4,330 ft. south of the Yankee Girl vein and more than 6,000 ft. south of Sunshine's Jewell shaft. An exploration drift to the west is now under way. Easterly drifting will be undertaken in the near future. At the point of intersection the fault showed a narrow seam of fault gouge in a 20-ft. shearing containing minor mineralization. Indications are that it may be a mineralized fault like the Silver Syndicate and Alhambra faults to the north.

★**Signal Mining Co.** has applied to DMPA for financial assistance to expand production at the old Hilarity mine in the Pine Creek area, which it is operating under working agreement. Plans call for sinking the shaft 200 ft. and opening two new levels. A sizeable ore shoot has been found in rehabilitated old workings and production is now being milled at the New Era mill.

★**Inspiration Lead Co.'s** exploration work along the Black Cloud fault at its property adjoining the Dayrock north of Wallace has entered a new formation believed to be very favorable.

★**Spokane-Idaho Mining Co.** mined 62,280 tons of ore from its Constitution mine on upper Pine creek last year and produced 8,439,000 lb. of zinc

and 3,562,000 lb. of lead. Ore sales, after freight and smelter charges, netted the company almost $1¼-million. President Frank Marr said the year was the most active and profitable in the history of the company.

★**Golconda Lead Mine's** 200-ton concentrator east of Wallace is being completely overhauled and modernized. New Fagergren flotation cells, six roughers and two cleaners, are being installed in both the lead and zinc circuits and the ball mill has been completely disassembled and rebuilt, with repairs and new parts as needed. The mill treats mostly custom ores.

★**Fortune Mining Co.,** Princeton Mining Co. and Eastern Lead Corp., with adjoining properties in the Pottsville area east of Mullan, are engaged in extensive surface exploration along a strong shear zone which passes across the entire width of all three properties. A common access road has been completed and trenching and stripping along the structure is now in progress. The shearing, identified on the recent USGS map of the Pottsville quadrangle as the Deadman's gulch shear, showed encouraging mineralization where opened last summer on the Worthington ranch to the west.

★**Idaho Silver Corp.** stockholders have approved a proposal to sell their 19-claim property east of Mullan to Silver Mountain Lead Mines, Inc., a new corporation which plans to consolidate several groups of claims in the area into one contiguous group for extensive development by Sullivan Mining Co. under a profit-sharing deal. Sullivan, jointly owned by Hecla and Bunker Hill, will pay the entire cost of the program and recover its outlay from any production which may result.

The favorable decision by Idaho Silver practically assures that the projected program will materialize. Idaho Silver will receive 771,000 shares of Silver Mountain stock for its property. Stockholders will receive one share of Silver Mountain for each 3.482 shares of Idaho Silver stock held.

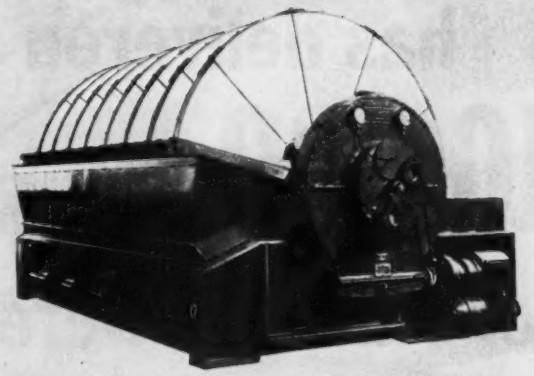
★**Coeur d'Alene Mines Corp.** has concluded a contract with the Atomic Energy Commission for a $20,000 program of drifting and diamond-drilling on a uranium-bearing structure discovered in the company's silver belt property near Osburn in 1949 by the AEC. The present showing is submarginal in grade, but the commission feels that the geological information to be gained by the work, plus the possibility of finding commercial grade ore, justifies the expenditure of federal funds on the program.

★**Lucky Friday Silver-Lead Mines'** last shipment of concentrates is expected to return the company about $386,000. The shipment totaled 26 cars of lead concentrates and two cars of zinc concentrates, from 10,000 tons of ore which averaged 9.2% lead, 17.5 oz. of silver and 1.04% zinc. The new 2000-ft. level of the mine is said to

EIMCO

Disc Type

CONTINUOUS VACUUM FILTERS



The Eimco designed disc type filter provides many exclusive advantages over other types of filtration equipment. Some of these advantages are: (1) greater tonnage per square foot of filter area, (2) even cake distribution, (3) uniformity in drying, (4) streamlined drainage grids, (5) longer bag life, (6) floating scraper assembly, (7) heavier overall construction, and many others.

Eimco disc type filters are completely automatic and dependable in operation. The heavy construction provides for continuous, trouble free, round-the-clock operation for long periods of time.

Hundreds of these units in operation today can be seen and inspected. Write for more information on Eimco drum, disc or top feed filters.

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TODAY, less than three years after the first production delivery, Allison has built and shipped 10,000 Torqmatic Transmissions for Army Ordnance vehicles.

These revolutionary cross-drive transmissions resulted from General Motors' long experience in the manufacture of heavy-duty transmissions and torque converters. They provide great mobility, maneuverability and easy control to America's tanks and other track-laying vehicles. Hydraulic gearshifting, steering, braking are combined in a single, compact unit. Operators in Korea say that tanks with these transmissions can "stop on a dime" and spin in their own length, with minimum driver fatigue.

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Today, Allison continues to deliver to commercial manufacturers Torqmatic Converters and Transmissions using the same basic principles. The Allison Torqmatic Drives bring smoothness, flexibility and economy never before experienced to many types of heavy-duty equipment such as are shown below. Write for information.

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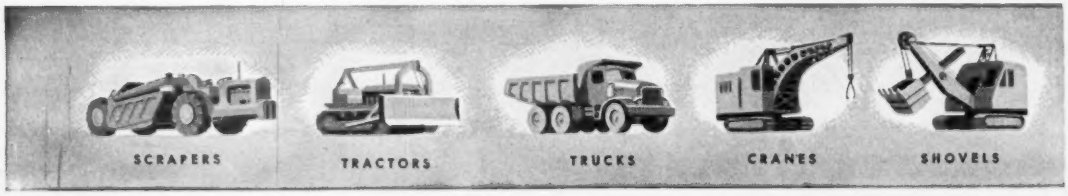

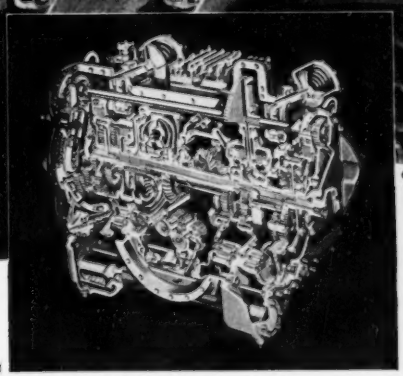

Illustrated is General Patton tank with cutaway view of Model CD-850 Allison Torqmatic Transmission

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GENERAL MOTORS

Allison

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Idaho (*Continued*)

be, by a substantial margin, the best yet opened. The east drift along the vein on this level has been in continuous ore for over 750 ft. and the first raise through to the 1,800-ft. level was in ore all the way which averaged 15-16% lead and 25 oz. of silver.

This summer the company plans considerable surface exploration at the 160-acre Jutila homestead on which it acquired mineral rights last year. Old surface tunnels will be reopened and examined and some diamond drilling may be done. The homestead, which adjoins Lucky Friday claims on the southeast, gives the company an additional ½ mi. of strike length along its vein structure.

KENTUCKY-ILLINOIS

★**Two major mining properties** in the Illinois fluorspar district have been sold recently. Victory Fluorspar Mining Co., operating in the Cave-in-Rock section of Hardin County since 1926, was purchased by A. H. Stacy and Sons from Martin Schwerin; and Minerva Oil Co., fluorspar division, bought all mining property and mineral rights of Yingling Oil and Mining Co. in Hardin County.

Included in Minerva's deal are the Rose Creek fluorspar mine and approximately 5,500 acres of mineral rights.

Victory fluorspar mine, flotation mill, and all equipment were included in Stacy's purchase. He had been associated with the Victory since Schwerin began its operation 26 years ago. His sons, A. C. Stacy, William G. Stacy, and Donald E. Stacy are co-owners.

★In underground work at its No. 1 mine, Minerva Oil Co., fluorspar division, is continuing dieselization of loading and short-haul operations, using an Eimco 102 loader and two 1½-ton Chevrolet dump trucks, equipped with Hercules diesel motors and scrubbers, to produce 325 tons of fluorspar-zinc ore per shift. Electric slushers are still in use part time.

By September, a new 420-ft. haulage drift from the east orebody to a 300-ton shaft storage pocket will be completed and equipped with a 30-in. conveyor belt, eliminating need for locomotive haulage on most of the ore to be produced in the future.

MICHIGAN

★**H. L. James**, Iron River, of the U. S. Geological Survey, is in charge of a crew conducting a geological study of the eastern half of Iron County and the southern half of Dickinson County, which includes the Menominee Range.

★**Globe Iron Co.** and E. C. Bradley & Sons have resumed shipments from

their respective silicious ore pits at Iron Mountain. The Globe made its first shipment on April 28 and the Bradley on May 7.

★**Shaft sinking continues** at Pickands, Mather & Co.'s Peterson mine at Bessemer. It is down more than 1300-ft. and will be sunk to an estimated 3900 ft. The Peterson is made up of the old Yale, Colby, Ironton and Puritan mines, some of which were opened up more than 50 years ago.

★**Hanna Iron Ore Co.**, at its new Cannon shaft, Stambaugh, because of wet, soft material encountered at about 115 ft., is using compressed air to complete the shaft to ledge. The Morton mine shaft at Hibbing, Minn., put down by Todd-Stambaugh Co. about 40 years ago under compressed air, is now being dug out by Hanna as the Morton is being converted into **an open pit mine.**

★**The Chicago & North Western Ry. Co.** has dismantled its old No. 2 timber ore dock at Ashland, Wis. There are now only two ore docks remaining at Ashland: one of timber belonging to the North Western, and one of steel and concrete operated by the Soo Line Railroad.

★**Jones & Laughlin Ore Co.'s** new Tracy mine shaft is being constructed so that minimum repairs will be required during the life of the mine. Since skips carrying 12 to 15 tons of ore will be hoisted at the rate of 1600 fpm, it is essential that the skip guides be firmly held in place. To accomplish this, every even-numbered set is being concreted to the rock, and the odd-numbered sets use bags of concrete for blocking. Concrete is mixed on surface and sent down the shaft through a 6-in. pipe. The Tracy is scheduled to join the ranks of 1-million - tons - per - year underground mines when full production is attained.

★**Plymouth Mining Co.**, in order to mine about 400,000 tons of merchantable ore near its Wakefield mine, is diverting the Little Black River to lead it around the orebody.

★New buildings being erected to serve the Cannon shaft of the Bengal-Tully-Baker mine, which is now being sunk, will cost about $8-million and will require some 18 months to complete. When finished, the Bengal-Tully-Baker is expected to have a model surface plant, the most modern and efficient in northern Michigan and Wisconsin. The Cannon shaft is ¼ mi. east of the present Bengal-Tully shaft which will continue in operation until the Cannon shaft and its surface plant are completed. The Cannon shaft will be 1700 ft. deep, of steel and concrete and is 15½ ft. by 20 ft. It will serve large known ore reserves on the six "40's" comprising the property.

★On May 7 the Menominee Range Engineers' Club for the Iron River-Crystal Falls area was organized. Regular monthly meetings will be held begin-

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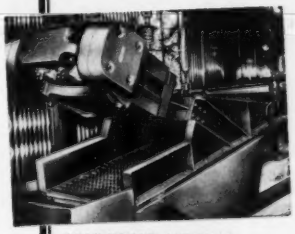

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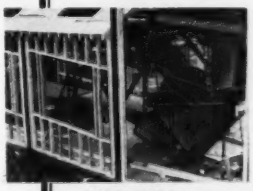

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Cutaway view of a typical cell used in batteries for mine haulage. High-strength steel construction is used in all cells.

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STORAGE BATTERIES

Michigan *(Continued)*

ning in the fall and all mining men of the district will be urged to join the new organization.

★A miner at an Iron River mine was killed on May 16 by a fall of ground from the side of the stope in which he was working. It was the first fatality at the mine for 6½ years. An investigation by county and company officials determined that the accident was unavoidable.

★A trailer park of 40 acres equipped with the necessary utilities is to be provided by the Copper Range Co. at its White Pine mine. It will serve the rapidly growing community until the permanent homes, numbering between 300 and 600, are erected. Some workers are expected to continue their trailer homes indefinitely.

★The Groveland pilot plant of the M. A. Hanna Co., near Randville, has been in full production since last December. The plant takes crude ore running about 33% in iron at the rate of 25 tons per hour and requires approximately 5 tons of water for 1 ton of ore, though much of the water is recovered and used again. The plant is operating six days a week. It will furnish the answer as to whether this low grade ore can be treated on a commercial basis.

MINNESOTA

★**Cleveland Cliffs Iron Co.** has taken options on iron ore lands in Venezuela on which it plans to do some exploratory drilling.

★**The Philip R. Clarke,** new ore freighter of the Pittsburgh Steamship Division of the U. S. Steel Corp., took on her first load of iron ore at the Duluth, Missabe and Iron Range Railway docks at Duluth on May 17. She has a capacity of 19,600 tons and was launched last November at Cleveland, Ohio.

★**The Minnesota Iron Mining Div.** of the Jones & Laughlin Steel Corp. is making an annual custom of distributing to each community in which it has mining operations, the savings effected by decreased industrial compensation payments. This year these payments amounted to $425 in Buhl; $1275 in Virginia; $850 in Calumet and $100 in Hibbing. In Buhl, the local CIO union requested that the money be divided equally between the cancer fund, the polio fund and the Red Cross. This was done and Milton Larson, president of the local union, presented the checks to the chairmen of the three organizations.

★**Ore shipments** from Upper Lake ports for the week ended May 17 were 2,916,794 tons against 2,963,181 tons for the corresponding period of 1951. For the season to that date, too, 1952 totals were slightly less than for last year: 13,416,169 tons compared to 13,-

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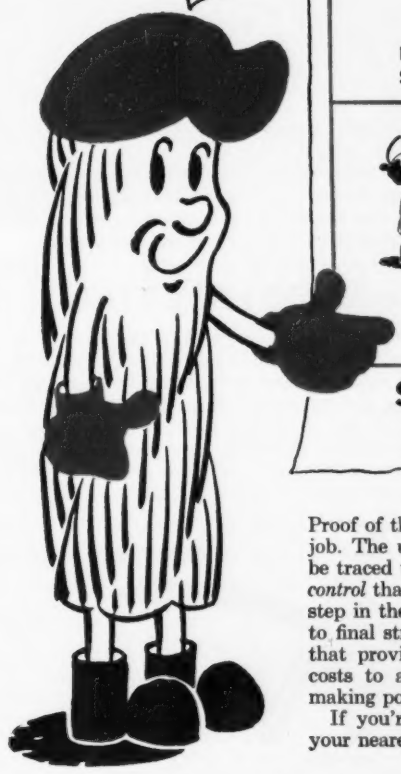
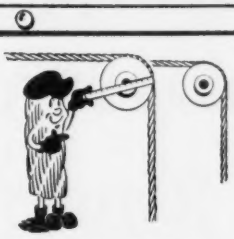


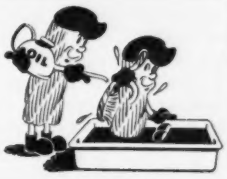


Avoid Small Drums and Sheaves

Keep Lines from Rubbing

Keep Drums and Sheaves Aligned

Check Your Sheave and Drum Grooves



Lubricate Your Lines Regularly

Use Jacks When Transferring Lines from Reel to Drum

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Since the first Holman rock drill was built, back in 1881, many new Holman patents and designs have advanced the technique of speedy and efficient rock drilling, and for many years now the development of an inherently *dustfree* drill for operating in dry rock has been a special Holman concern. Now, in the DRYDUCTOR, comes the world's first successful *dustfree* dry rock drilling equipment.

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Since 1945 Holman endeavour and experiments have been concentrated on the principle of dust extraction through the rock drill itself. Six years of intensive effort were eventually rewarded with complete success : the Holman DRYDUCTOR was announced to the world in December, 1950. Subsequent experience has fully justified the efforts and the original claims of the designers, and has amply demonstrated that the DRYDUCTOR is in fact the answer to the problem of dust. The Holman DRYDUCTOR patents are undoubtedly destined to play an increasingly significant rôle in the battle against dust diseases in mines, collieries, tunnels, quarries—wherever dry rock is drilled.

In Operation in CANADA. *Holman DRYDUCTOR, mounted on Airleg, drilling dry rock. The photograph shows the two pipelines, one providing compressed air, the other leading the dust safely away from the operator.*

The DRYDUCTOR

The DRYDUCTOR actually extracts every particle of *dry* dust as it is made, passes it through the hollow steel and the drill, and draws it safely away from the face by pipeline under vacuum to a position far removed from the drills and their operators. The DRYDUCTOR operates efficiently with any of the standard methods of dust disposal and recovery.

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Minnesota (*Continued*)

477,719 tons. This was probably due to the steel strike which slowed up shipments from some mines.

★**The Great Northern Railroad** is gradually replacing its giant steam Mallets for hauling iron ore from the Minnesota ranges to Lake Superior with diesel locomotives. The 7 three-unit diesel electrics now in use are expected to be increased to 15 by July 1. They are faster, making two round trips in 24 hours, and able to haul more cars than the steamers they are displacing.

★**M. A. Hanna Co.'s** Enterprise mine at Virginia began stripping on a full scale April 30, and is operating 20 shifts per week. It is expected to ship some ore during the 1952 season.

At Cooley, the Galbraith and Patrick plants began washing ore on April 14 and the Harrison plant on April 15. The sinter plant at the Portsmouth mine, on the Cuyuna Range, was started on April 9; and the 1150 B. dragline-conveyor stripping at the Morton on April 29.

★The 28 annual conference of the Lake Superior Mines Safety Council was held in Duluth on May 22 and 23. More than 700 mining men from all sections of the country attended. George A. Borgeson of Hibbing, president of the Council, presided.

MONTANA

★**Kootenay Copper Mines** has resumed developments at the Green Mountain Mining Co. property, which it has leased, near Dixon, Sanders County, under Steve Giulio, superintendent. Present plans call for extending the incline shaft from 227 ft. to the 327 ft. level and driving 500 ft. on a new No. 4 level. The company received an exploration loan from the government.

★**Hon. Arnold H. Olsen,** attorney general of Montana, has rendered an opinion to Hon. M. Baxter Larson, chairman of Montana's Industrial Accident Board, stating that under the state mutual insurance plan for industrial accidents, the operator of a hazardous industry must pay a premium on the entire compensation received by every workman, except salary and wages paid during actual vacation. A previous director had made an administrative interpretation informing that a premium would not have to be paid on "overtime pay and bonuses."

★Butte Copper & Zinc Co., in 1951, produced 302,379 wet tons of manganese, lead, and zinc ores, bringing in gross proceeds of $7,114,242 and a net income of $766,196, as compared with $692,080 for 1950. The company, whose property is situated south of the business district of Butte, extended its management agreement

with the Anaconda Copper Mining Co. until June 30, 1961, and paid a dividend of $1.25 per share in 1951.

★**American Chrome Co.,** a subsidiary of Goldfield Consolidated Mines Co. is reported to have made an agreement with the government to furnish the latter with 900,000 tons of chrome concentrates between 1953 and 1961, from the Mouat mine in Stillwater County. Under the agreement with the Defense Materials Procurement Agency, American Chrome has agreed to supply working capital of $950,000 and DMPA will advance a similar amount against production. The government will supply up to $1,815,000 of equipment on a loan basis. The basic price to be paid for the concentrates, which must contain at least 38% chromic oxide, is $34.97 a ton.

★**Madison County Mining Association,** a chapter of the Mining Association of Montana, held a dinner and meeting at Twin Bridges on May 3, at which Mrs. Camilla Gage, Twin Bridges, presided. Dr. E. S. Perry, Butte, member of the geological staff of the Montana School of Mines and the Montana Bureau of Mines and Geology, spoke on the possibilities of the nonmetallic minerals of Madison County. Short talks were made by Dr. J. R. Van Pelt, president of the Montana School of Mines, and Carl J. Trauerman, secretary of the Mining Association of Montana.

★American Alloy Metals, Inc., headed by E. A. Julian, San Francisco, and Frank Eichelberger, Spokane, has completed work provided by a government exploration loan on a group of tungsten claims in Beaverhead County, south of Butte, Montana. The work has been certified, which means that the company now is in a position to seek other federal help for development of the deposits. A compressor has been installed, a 250-ft. double track tram driven to the adit level which has been advanced about 50 ft. toward the underground extension of the orebody from outcrops on the surface.

★Silica Products Co., Inc., will shortly resume development work on its phosphate property near Elliston, Powell County. The company also will reopen its Negros lead-zinc property, formerly known as the Deer Lodge Queen, 7 mi. from Elliston. Walter Birkland and H. C. Beck, both of Tacoma, Wash., are respectively president and secretary of the company.

★Minerals Engineering Co., headed by Blair Burwell of Grand Junction, Colo., has resumed operations at its Sugarloaf tungsten property on Lost Creek, about 3 mi. south of the Brown's Lake project of the American Alloy Metals, Inc., Beaverhead County.

NEVADA

★**Construction of a new concentration plant** at the Three Kids manganese

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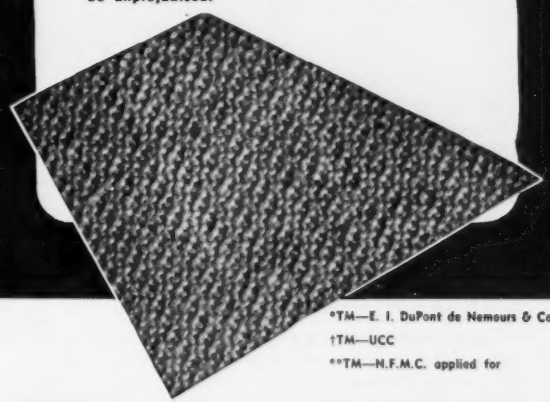

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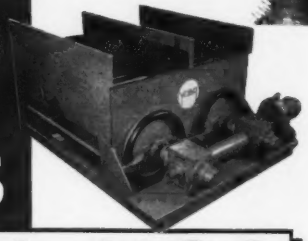

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41

Nevada *(Continued)*

mine in Clark County has been started by the McNeil Construction Co. Completion was expected about the first of this month when Manganese Inc., owner of the property, expected to start production. Concentrates and nodules will be shipped to government stockpiles, and then to steel mills. The property's production during the last war was of major importance, but it has been dormant since then. McNeil Co. has 200 men at work on the mill job, and plans include construction of several houses near Henderson to provide quarters for the miners.

★**Expansion program** is under way at the Mohawk silver-lead mine west of Silver Peak in Esmeralda County. Seven men are working now, but timber is being hauled to construct housing for 20 more employees. Hauling ore began in May, and the Silver Peak mill has been put into operation to handle it. The tunnel has been driven on the ore for a distance of more than 250 ft. with both walls still in the ore. Ore is reported to be more than 25 ft. wide in some places. Bruhi Enterprises are in charge of the development program. Heads of the concern are Avery Brundage, Chicago, and E. R. Hines, Tonopah.

★**Garnet King Mining Co.** is erecting a mill and constructing a camp site at Cucamonga. The mill will have a 100-ton capacity and will treat tungsten ores. The ore is near the surface, and will be mined by stripping operations. W. H. Allured is superintendent of the project.

★**Discovery of a significantly large supply** of quartz crystal in White Pine County has been announced by government officials. The find was made on the Goshute Indian Reservation near the Utah border.

★A patch of tungsten ore in the Shafer mine in White Pine County is reported to be running between $600 and $1,000 per ton. The property is being operated by Baltimore Camas Mines Inc., an Idaho concern headed by G. P. Williams, of Boise. The company is vigorously developing the find, and is starting a diamond drilling program. The company is also engaged in dismantling its 100-ton concentrating mill at Camas, Idaho, for transportation to Ely where it will be set up to handle the Shafer ore.

★**Reactivation of the big Union Lead mine,** south of Reno is expected in the near future. Imperial Lead Mines Co., of El Centro, Calif., has been given clear title to the property, following long litigation, and plans to build a mill on the site to process the ore. The mine is reported to have large potential ore reserves, and has been a producer for many years. Several buildings on the property are in useable condition.

★**Ore shipments have started** on a large scale from the Simplot Mines

Men who depend on power...know they can depend on CUMMINS®

Every CUMMINS DIESEL is built not once but twice

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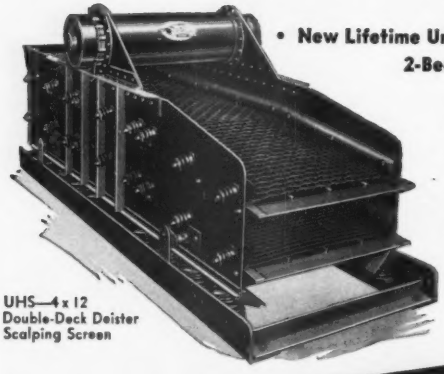

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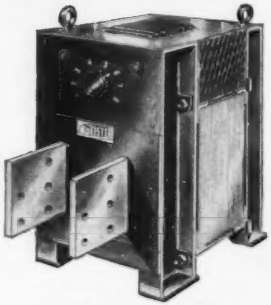

New Deister Electric Heating Unit.

DEISTER SCREENS

DEISTER MACHINE COMPANY
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Nevada *(Continued)*

Co. iron mine in Elko County at 7,200-ft. elevation. Work was held up by snow during winter and early spring; however, the road to Palisade is now in good condition and a large fleet of trucks is hauling out the ore from the open pit operation. Mining is done by benching, and there are already six benches set. The Simplot Co. recently signed a contract with the Japanese Government for 300,000 tons of this ore.

★**Combined Metals Reduction Co.'s** $5-million expansion project at the Caselton plant in Lincoln County should be completed by Aug. 1. Mine production will be increased from 700 to 1,600 tons per day, and mill capacity will jump from 1,100 tons to 1,900 tons per day. The project includes the addition of a large air compressor, installation of a service hoist in the Caselton shaft, remodeling of main pump stations, clearing out the service compartment of the shaft, construction of a new lamp house, and additions to the mine's surface plant. Leonard West, plant engineer, is in charge of the new construction.

★**Construction is almost complete** on a new tungsten processing mill at Lackawanna, near Ely. Machinery consists of a Marcy mill which will handle approximately 100 tons of material every 24 hours. Jigs, tables and a flotation system are being moved to Ely from Hailey, Idaho. Baltimore Camas Mines Inc., carrying out the project, applied for a $160,000 federal loan. It was refused because there are three other mills operating in the vicinity.

★**Copper Butte Mining Co.** has been cleaning out tunnels and making repairs on the Buckskin mine in Mason Valley. N. L. Brown, Wabuska, manager of the project, says 300,000 tons of copper sulphides have been blocked out, with assay running from 2 to 10%. A 50-ton mill is planned at the site. The Copper Butte Co. recently acquired a five-year lease on the property from Schultz & Bronson.

★**The FRH Mining Co.** is constructing a new mill at Castle Mountain in Lander County with completion expected almost immediately. New mill will handle 100 to 125 tons daily, and will replace an old mill which is unsatisfactory. The company plans to push work on its numerous tungsten claims. H. R. Fisher, Salt Lake City, is general superintendent of mining and milling operations, and Willard Eddison is resident superintendent. Donovin Miller and Ralph Monroe are president and secretary.

NEW MEXICO

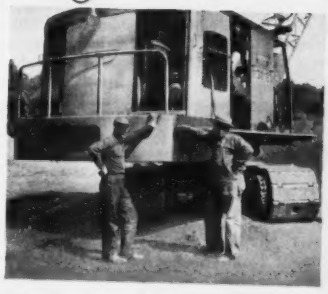
★**Anaconda Copper Mining Co.** has received approval from the U. S. Bureau of Indian Affairs to proceed with

GM Diesel
Case History No. 728-53

USER: Brown Coal Co.,
Center Point, Indiana

INSTALLATION: 38B Bucyrus-Erie 1½ yd. dragline powered by Model 6-71 GM Diesel.

PERFORMANCE: Owner reports stripping 3500 yards overburden per 10-hour day, using 3 gallons of fuel per hour. Mine produces up to 280 tons of coal per day.



THIS DIESEL

strips 350 yards an hour on 3 gallons of fuel

Co-owner K. W. Brown says, "This rig came with a General Motors Diesel and we're plenty happy that it did. Couldn't ask for better power both on this machine and the HD-10 tractor on which we've put 2000 hours in 6 months." Because of its efficient, quick-acting 2-cycle operation, the GM Diesel engine gets more work done at lower cost in all kinds of mining equipment—draglines, shovels, trucks, tractors, locomotives, compressors and generators. Ask your nearest GM Diesel distributor for the complete story.

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New Mexico *(Continued)*

a lease agreement with the Laguna tribe of Indians. The company will mine uranium on 800 acres of proven ground. The lease is for 10 years, or longer, if paying quantities of ore continue to be found. The Laguna Indian Pueblo reservation starts 18 mi. west of Albuquerque and runs west. An anaconda official said exploration work on 405,000 acres of Indian land would continue

★**The tribal council of Acoma,** another Indian village reservation west of Laguna Pueblo, known to tourists as the "Sky City," has granted a prospecting permit to F. A. Sitton, of Dove Creek, Colo. Sitton is already active in uranium development on the Navajo Indian reservation.

★**Uranium mines** now dot one of the most colorful areas of the Navajo Indian reservation in northeastern Arizona—Monument Valley. Monument Mine No. 2, operated by Vanadium Corporation of America, is said to be the largest uranium operation in the United States. Another sizeable operation in the same area, in the Lukachukai and Carrizo Mountains, is being conducted by Cato Sells, full-blooded Navajo. Sells is working some of his claims as an individual, some in co-operation with the Climax Uranium Co.

★**Local 890 of the Mine-Mill Union,** which maintained a long fight with the Empire Zinc Co. at Hanover, N. M., last winter, is circularizing businessmen of Silver City for support in its demands for a wage increase of 25¢ an hour, doubling of night shift differentials, health insurance benefits, one week's severance pay for each year of employment, and other items. The union's contract which involves 1,400 miners in the Central district expired in June.

★**Great Western Mining Co.** is installing new equipment at its mica operation at Mora to speed output of scrap mica.

★**Drilling operations** to explore the Tyrone orebody, Silver City, are being pushed by Phelps Dodge. Between four and five years' exploration work remains.

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NORTH CAROLINA

★**Toe River Mica Co.** of Spruce Pine, has obtained a certificate of incorporation from the North Carolina secretary of state to mine, process and sell mica and other minerals. The firm has authorized capital stock of $100,000 and the incorporators are H. T. Barksdale, James Carpenter, and D. E. Collis, all of Spruce Pine, and others.

OREGON

★**The only plant in the country** using perlite aggregate as a base for mineral acoustical tile has been purchased from Dant & Russell, Portland, by the Kaiser Gypsum Division of the Henry J. Kaiser Co. Included in the sale are the Lady Frances open-pit mine, processing and acoustical tile plants, office building, warehouse, residences for the staff and living quarters for unmarried workers. High-grade perlite ore at the site is estimated to be sufficient for 50 years' continuous operation.

★**In raising the amount of chrome ore** it will buy from any one source from 2,000 to 5,000 tons a year the government has stirred activity in southern Oregon and northern California. The Oregon State Mining Association was influential in obtaining the government order increasing the limit. Chrome producers of the area have organized a committee in conjunction with the mining association in chrome mining matters. A survey recently completed by the Oregon State Department of Geology and Mineral Industries indicates the state chrome production over the three-year period covered by the government's purchasing plan will total over 400,000 tons.

WKE

another WKE job in progress!

This new 1000 ton lead-zinc selective flotation concentrator, located near Northport, Washington, is another contribution to the industrial strength of America. It was designed and is being built by WKE for one of the nation's major mining companies, and is scheduled for completion in the fall of 1952.

The extensive and specialized skills available in the WKE organization have been responsible for many other noteworthy additions to United States industrial capacity.

OTHER WKE PROJECTS IN PROGRESS

1. **Coons-Pacific Company,** Minnesota, recently placed this 300TPH iron ore concentrating plant in operation. WKE participated in the design of this plant. It includes a heavy-media Mobil-Mill, a jig concentrating unit, and a spiral unit.

2. **Triumph Mining Company,** Hailey, Idaho recently placed this 200 TPD lead-zinc selective flotation plant in operation. It was designed and built by WKE.

3. **Basic Refractories, Inc.** at Gabbs, Nevada, is operating a 50 TPH heavy media Mobil-Mill for processing brucite; — plant designed and built by WKE.

4. **Del Monte Properties Co.,** Pacific Grove, California, is utilizing WKE design and engineering service for construction of a unique 50 TPH sand attritioning and selective flotation plant.

W.K.E.

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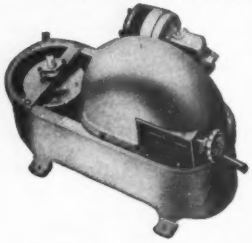

used more than all others?

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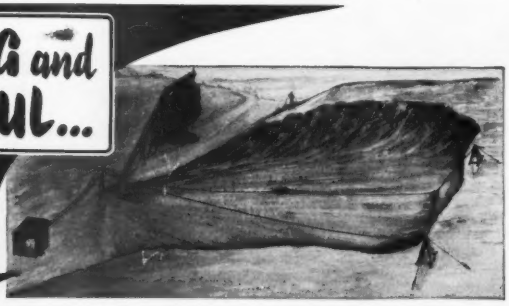

With One Man

Above—Sauerman Drag Scraper cuts deep into hill and moves gravel to crusher

SAUERMAN SCRAPER

Old pile of mine waste covering 12 acres is reclaimed and delivered to crusher at rate of 50 tons an hour by small Sauerman Scraper driven by a 30 h. p. motor.

Here is a Sauerman Crescent scoop equipped with a trolley carrier for a track cable scraper installation. This type of installation, with the head end elevated considerably above the tail end, permits gravity return of the empty scoop from dumping point to digging point.

Why complicate what should be—and can be—a simple job? All you need to move material quicker, at lower cost, is a Sauerman Scraper machine — the heart if which is the uniquely shaped Crescent scoop. The design of this bottomless "bucket" permits faster loading to capacity . . . smooth travel of load across the ground . . . clean, automatic dumping at discharge point.

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Oregon *(Continued)*

★Scrap material said to be a mixture of metals, chiefly tin and copper, is being used by the metallurgical division of the Bureau of Mines at Albany, to produce critically needed tin cheaply, according to the May issue of *Bureau Bugle*, published by the Bureau of Mines Associates, Inc., Albany. The material is said to come from another government agency which is unidentified. The tin is cast into 50-lb. ingots and a photograph accompanying the article showed stacks of ingots totaling 60,000 lb. worth approximately $100,000. The article stated, "Our production of tin during the first six months of operation has been sufficient to repay the cost of building the plant, purchasing the equipment and operating the plant. If this plant would continue to operate at its rated capacity of 1,000 lb. a day, pure tin could be produced here at a cost of 30¢ a lb.—one-fourth to one-sixth the price paid for imported tin during the last war."

★Work at the mercury property of Lawrence Roba in Grant County was begun this spring after a shut down due to heavy snows.

TENNESSEE

★Electro Manganese Corp. has obtained a city permit for construction of 10 buildings for its new plant in Knoxville. Estimated cost will be about $800,000 for construction, and about $1,600,000 for equipment.

UTAH

★Kennecott Copper Corp. has been granted a DPA certificate of necessity for a planned $3.3-million renovation of the Arthur and Magna mills of the Utah Copper Div. The big job will be replacement of the current flotation equipment with cells of larger size to recover more copper and molybdenum.

Kennecott spokesmen in Salt Lake City expect competitive tests of new equipment to take a year.

★Chemical Construction Corp.'s new process will get its first major large-scale test this summer at Howe Sound's new $2.5-million cobalt refinery. Autoclaves, tanks, piping and high-pressure pump equipment is in the final stage of installation. M. C. Purdy, superintendent of construction, says that the plant should be complete late in July.

The plant, according to Maj. Gen. William N. Porter, Chemical Construction president, will process 35 tons of 20% cobalt concentrate from Idaho mines of Howe Sound's Calera Mining Co. daily, for an annual output of 200 tons of pure cobalt. This

output would be equal to one-third the U. S. consumption for 1950, and reportedly would boost world output by 30%.

★**American Smelting & Refining Co.** has acquired five claims in Utah's Marysvale uranium district under a lease and option contract with the Plumbic Mines Co. and Call Industries Inc. of Pocatello, Idaho. The latter concern retains a basic royalty in the transaction while Plumbic is reported to hold an overriding royalty.

Under the lease and option as executed, AS&R is to engage in diamond core drilling on the claims, which comprise about 100 acres. The land is due south of the Bullion Monarch Co. operations and adjacent on the southwest to Vanadium Corporation of America diggings. Boyles Bros. Drilling Co. of Salt Lake City has contracted for two diamond drill holes on the claims, with a third contemplated later.

AS&R is reported planning to drill its first hole north from the bottom of the Plumbic incline, with intersection of the mineral-bearing fissures in the eastern sector of the claim as the objective. The second hole will be on a 30 deg. angle from the vertical and will be run from the surface in southerly direction.

AS&R last winter obtained leases on some 700 acres of claims of the Marysvale Uranium Co.

★**The Atomic Energy Commission** reports that arrangements have been completed for development of such government-owned uranium as may exist inside the Capitol Reef National Monument in Wayne County.

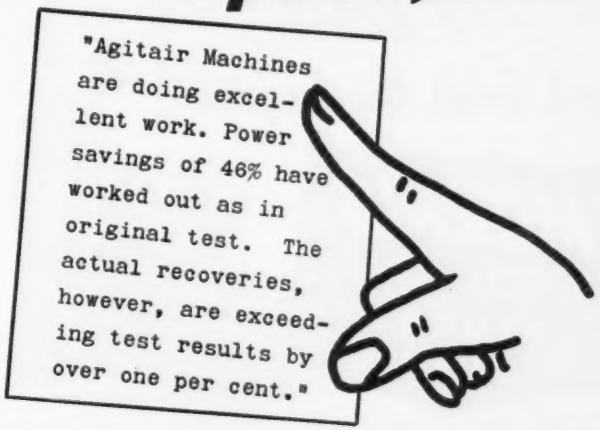
Frank MacPherson, manager of the Raw Materials Division office of the Grand Junction, Colo., AEC office, reported a number of inquiries from prospectors, with the result that the AEC is offering seven-year permits to prospectors. These permits may be canceled at any time by the Secretary of the Interior.

Applications for exploration permits are already being processed in the Grand Junction AEC office. If exploration work proves promising, then mining contracts would be entered into by the AEC.

★**Alarmed by cuts in the price of lead** that brought New York custom smelter prices down to 15¢ per lb., Miles P. Romney, manager of the Utah Mining Association, warned that "if the price of metals fails to revive some operations may have to close down." He noted that price drops have cost Utah operators some $3.60 a ton.

★A near-tragedy was averted in mid-May at the Combined Metals Reduction Co. lead-zinc mine near Bauer when 40 miners, nearly trapped by a blaze in timbers on the 250 ft. level, escaped by drain tunnels and other routes. Fire was discovered by miners at work in an air shaft on the 200 ft. level. After a futile attempt to extinguish the blaze, they got to the

It's impolite to point, but...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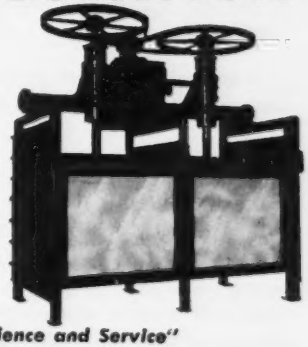

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Utah *(Continued)*

surface via the airshaft. Workers far below in the 2100 and 2300 ft. levels were warned via telephone, and evacuated the deep tunnels by way of the drainage tunnel on the 1200-ft. level.

★**A special Wage Stabilization Board panel** (May 27) recommended an overall wage increase averaging 20.13¢ per hour in a case involving CIO United Steelworkers Union employees at the United States Smelting, Refining and Mining Co., New Park Mining Co. and Combined Metals Reduction Co. operations.

The wage increase recommendation was made subject to review by the National Wage Stabilization Board. The majority panel report recommended that of the total 20.13¢ boost, 8¢ an hour be used for a wage raise, with the remaining 12.13¢ per hour to be used in eliminating "intra-plant inequities" through a job evaluation program.

Industry members of the panel, issuing a minority report, said "adoption of the majority report will unstabilize the wage structure in the entire nonferrous metal mining and smelting industry."

★**New Park Mining Co.** has registered a gain in 1951 net income over that of the previous year despite rising costs, according to the annual report issued by president W. H. H. Cranmer. Net income after all charges except depletion was $267,927 for 1951 as against $248,062 in 1950. Ore shipments rose from 70,840 to 88,296 tons, with an increase in gross value of $552,763 over the previous year. Values for 1951 were given as zinc—$886,704; lead—$867,021, and gold—$510,348.

Average grade of ore mined increased from the previous $24.39 to $25.70 per ton; development and exploration footage increased from 4,192 to 8,326. The latter footage was the greatest of any in company history.

However, mining costs increased from the 1950 level of $1,387,640 to a 1951 figure of $1,853,371.

★**East Utah Mining Co.** showed a $2,371 loss for 1951 as against a net profit of $2,341 for 1950, according to W. H. H. Cranmer, president.

WASHINGTON

★**Pend Oreille Mines & Metals Co.** will further reduce its mining costs by the installation this season, of trackless mining equipment new to the area. In 1951 total costs were reduced to $5.10 a ton, compared with $6.07 a ton in 1950. Net income of the company in 1951, according to the annual report, was $144,876, compared with $41,949 the previous year. Milling in 1951 amounted to 273,520 tons of ore which yielded 6,045,914 lb. of lead, and 12,950,584 lb. of zinc. Sales

of concentrates amounted to $2,079,-363, compared with $1,215,719 in 1950. The report showed that earnings for the first quarter of this year were approximately 60% greater than in the same period in 1951. A $597,034 dividend, or 25¢ a share was declared in the first quarter. Pend Oreille received a dividend of $346,924 in the first quarter of 1952 from Reeves MacDonald Mines, Ltd., a subsidiary across the Canadian border.

★**Howe Sound Mining Co.** which operates the Holden copper-zinc-gold property near Lake Chelan paid 35¢ a share dividend June 10 on its $1 par common stock. This is said to be equivalent to $1.05 on the old stock. Seventy-five cents was paid in March before the 3-for-1 split.

★**Lead production** in the state amounted to 1,322 tons in March, compared with 1,177 tons in February. Monthly average for 1951 was 663 tons. Zinc production was 1,650 tons in March, compared with 1,680 in February, and a monthly average in 1951 of 1,595 tons.

★**Lead Hill operations** which were closed this spring because of road conditions, were reported resumed May 15. American Zinc, Lead & Smelting Co. which operates the property hauls the ore to the Grandview mill near Metaline Falls.

★Clarence B. Reynolds, field engineer for Three Peaks Mining Co. reported that stripping operations are in progress at the Kulzer and Electric Point properties in Stevens County from which large scale iron ore shipments are expected. He reported **100,000 tons of iron ore already exposed** at the Kulzer, where open pit mining was scheduled to start at an early date. He said shipments would probably go to steel mills at Gary, Ind. At Electric Point, stripping was proceeding both north and south of the location which yielded rich lead years ago. A vein has been uncovered for about 1,000 ft., with width averaging about 25 ft. Iron ore from this property will be freighted to Seattle and then sent by ship to Japan. The company also expects to take iron ore from the Thompson deposit near Deep Lake in Stevens County.

★**DMEA is reported to have signed 87 contracts** in the four Pacific Northwest states in about 12 months totaling $4,134,841 with the government's share being $2,324,057. The largest of the last four contracts reported is with American Zinc, Lead & Smelting Co. for the Bluebird lead-zinc property on Slate Creek in Pend Oreille County. Exploration expenditures will amount to $116,500 with the government's share being $58,250.

★**Pioneer Mining Co.** of Colville, reelected all its directors at a stockholders meeting in May, and directors elected the following officers: D. A. Newland, president; Jack Somerlott, vice-president; Melvin Pearson, secretary-treasurer, and Fred Douglas and John King, directors.

★**Pacific Northwest Alloys, Inc.**, which operates the government's Mead magnesium plant was scheduled to hand out over $15,000 to its approximately 400 employees as a result of a settlement of a wage adjustment covering a period from March 4 to June 9. The WSB ruled that the general wage increase should be retroactive to March 4.

★**Kaiser Aluminum & Chemical Corp.** announced in May that it would add about 500 men at its Trentwood and Mead plants during the next few months. Production superintendent, David Mayers, said between 250 and 300 would be added immediately at the rolling mill in order to step up production from 20-million lb. of aluminum sheet monthly to 24-million lb. Between 200 and 225 were to be added at Mead before the end of June, according to J. H. Lindemuth, works manager at the reduction plant.

★**Telesite Mining Corp.** is planning to drive a 170-ft. tunnel on the Sherman group of mining claims on Pogue Mountain in Okanogan County. Operations were scheduled to begin in May. It is reported that Victor Smith has leased 720 acres to the company.

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IN CANADA

BRITISH COLUMBIA

★International Union of Mine, Mill & Smelter Workers has won a two-year fight with United Steelworkers of America at **Consolidated Mining & Smelting Co.** of Canada's Trail plants. Mine-Mill defeated the Steelworkers by 280 votes in a government-supervised ballot to determine the bargaining agency for 3900 Cominco workers. Some 94% of the workers voted. Result was 1,949 votes for Mine-Mill, or 53%, and 1,669 for Steel, or 42%. Against any union were 49, while 13 ballots were spoiled. Mine-Mill recently turned back on AFL Chemical Workers Union bid for certification at Cominco's nitrogen plant in Calgary, Alta.

★**Gray Rock Mining Co.**'s 20-claim antimony-silver property on Truax Creek in Bridge River district will be developed by Bralorne Mines Ltd. The mine, acquired from Bellore Mines, Ltd., has been developed over the past three years, with indications of good commercial widths of **antimony ore.** Assay of ore from No. 2 vein shows 50.2% Sb, 0.18 As, and traces of lead, zinc, copper, selenium, and tellurium. Bralorne plans driving of a 1,000-ft. crosscut some 300 ft. vertically below No. 1.

★**Quatsino Copper Gold Mines Ltd.**, resuming work on exploration of its magnetite iron ore deposit near Quatsino Sound, Vancouver Island, reports discovery of a cobalt vein 5 ft. wide, with a strong structure already exposed in an open cut. Assays indicate a grade of 8.6 lb. of cobalt per ton. S. M. "Mac" Manning, mining engineer who has managed properties for American Smelting and Refining Co. in British Columbia, Saudi Arabia, and recently Bolivia, was retained to take charge of the iron ore exploration.

★**Argonaut Construction Co.**, subsidiary of Utah Construction Co. of San Francisco, already exporting iron ore to Japan from Quinsam Lake on Vancouver Island, is starting shipments from a second mine on Texada Island, and is diamond drilling on another iron ore deposit, on the Iron River property of Canada Collieries (Dunsmuir) Ltd., near Quinsam. Shipments from Quinsam and Texada are to total 100,000 tons monthly at full capacity. Argonaut has a three-year contract with Japan and so far has proved up 3-million tons of ore. **Western Canada Steel Co., Ltd.**, Vancouver, a new amalgamation of three Vancouver companies, has taken delivery of some ore concentrate for smelting tests.

★**Seymour Mining Corp., Ltd.** has been formed by a Vancouver group of engineers and investors to develop a new base metal mine about 28 mi. north of Seymour Arm on Shuswap Lake in the Kamloops mining division. Indicated tonnage of lead-zinc silver ore is estimated at 800,000 tons. It is hoped exploration will double this, providing sufficient ore to feed a 1,000-ton mill for five years. The ore is believed to contain commercial grade copper and iron. Preliminary assays indicate 2 oz. silver per ton, 6% lead and 5% zinc.

★**Big Four Silver Mines Ltd.** has been wound up by approval of its shareholders, and its four famous old silver, lead and gold properties on Portland Canal taken over by the recently-incorporated Cassiar Consolidated Mines Ltd. The four properties, Porter Idaho, Prosperity, Silverado and Silver Ridge will be developed by Consolidated Mining & Smelting Co. under an agreement with Cassiar whereby 2-million shares are optioned to Cominco.

★**Kootenay Base Metals Ltd.**, near Cranbrook, has put its new mill into operation, with a rate of 50 tons daily being maintained during the first part of May when 660 dry tons averaging 4% lead and 7% zinc were handled. Grade is expected to be 14% combined lead and zinc when stoping begins soon.

★**Sil Van Consolidated Mining & Milling Co.** has opened new ore within a

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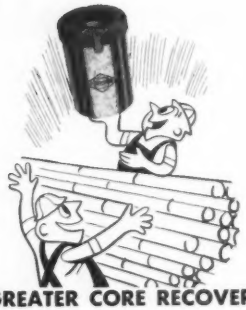

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vertical range of 450 ft. and is making good progress on preparing for production this fall with a 150-ton mill. The new ore shoot on the 3,800-ft. level at the bottom and on the 4,250-ft. level at the highest point exceeds the width of the drift.

★Western Mines Ltd. reports operating profit for March was $15,733. The mill handled 2,006 tons grading 5.6% lead and 2.5% zinc, compared with 1,866 tons in February grading 5.8% lead and 2.8% zinc.

★A prospecting syndicate, headed by C. S. Powney of Fort St. James, has reported striking bauxite ore in commercial quantities in the Vanderhoof area, 200 mi. west of Kitimat, site of Aluminum Company of Canada's planned $550-million hydro-refinery project. Powney says that preliminary assays of ore indicate that it is of considerably lower grade than the bauxite alumina Alcan plans to import from Jamaica, but that it could be used as a secondary source for Kitimat in case of shipping difficulties.

MANITOBA

★San Antonio Gold Mines Ltd. will press underground development of its subsidiary, Forty-Four Mines, to ready it for production within the next two years. During 1951, a total of 1,712 ft. of lateral work and 3,498 ft. of diamond drilling was carried out, opening up 296 ft. of ore having a width of 9.8 ft. in the 18th, 19th and 23rd levels. This brings total ore length developed to date on "44" ground to 829 ft., averaging 8.8 ft. in width.

During the first quarter of 1952, 394 ft. of new ore averaging 0.34 oz. across 4.5 ft. has been developed on San Antonio ground. On the Forty-Four ground, 127 ft. of ore averaging 0.36 oz. across 5.0 ft. was opened up during the same period.

★Sherrit Gordon Mines reports that the program of moving the dismantled Sherridon plant to Lynn Lake is ahead of schedule. Nearly all mine buildings have been re-erected at the new site and machinery and equipment are being installed. The mining plant at the "EL" mine will be ready to operate as soon as power is available. Underground work at the "A" mine has been concentrated on preparation of the orebody for mining. The Laurie River power development is expected to be in operation before fall. Work in connection with the nickel refinery at Fort Saskatchewan, Alberta, is just starting.

★Hudson Bay Mining & Smelting Co. Ltd. announces ore intersections at a depth of 4,800 ft. This is the first report of ore intersections below the 3700-ft. level in the main mine. A drill hole from the 4500 level cut two ore sections 300 ft. below the level and 200 ft. into the footwall of the main ore zone. The first intersection cut 14 ft. of ore running 4.7% copper with values in gold, silver and zinc giving a gross value of $24 per ton. The second intersection, 25 ft. deeper, ran $13 over a width of 13 ft.

★Howe Sound Exploration Co. Ltd. operated their Snow Lake Mine at full capacity (2,000 tons) throughout 1951. Grade of ore was below that of the previous year. Through the development of a new orebody, it hopes to raise its grade to an average 0.16 oz. per ton. The main shaft has been deepened by 535 ft. to a depth of 1,473 ft. and two new levels started.

★Consolidated Lebel-Oro Mines Ltd. is diamond drilling on a copper-zinc prospect at the south end of Herb Lake, Manitoba.

NORTHWEST TERRITORIES

★Discovery Yellowknife Mines, operating at Giauque Lake, Yellowknife district, reports bullion production for the first four months of this year totalled $417,499, with net operating profit estimated at $183,000. Output was 11,965 oz. gold from 11,068 tons of ore. In the first four months of

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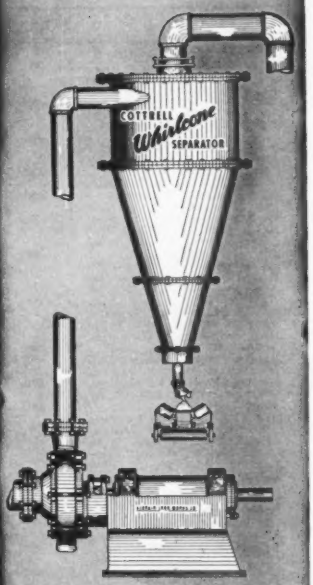

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Canada *(Continued)*

1951, 6,997 ozs gold were produced from 10,379 tons.

★**Consolidated Mining & Smelting Co.** is reported to have indicated by diamond drilling in the Pine Point area on the south shore of Great Slave Lake a large potential lead-zinc ore tonnage. Cominco has been carrying on extensive drilling for the last four years.

ONTARIO

★**Ontario Pyrites expects to raise $1.6 million** through sale of stocks to shareholders to finance its extensive Sudbury Basin property pretty well into the production stage. First efforts are being concentrated on the Treadwell holdings where a large tonnage of complex copper-zinc ore was developed in the 1920's. Plans call for a milling rate of at least 1,000 tons per day.

★**Biggest source of prospecting interest in Ontario is iron,** with three new areas getting attention. About 3 mi. north of Port Hope, industrial town on the north shore of Lake Ontario, Jalore Mining Co. has started drilling a 2,000-acre optioned block where aerial surveys have shown several impressive anomalies. Any ore found would be deep, for the PreCambrian is overlain by hundreds of feet of sediments.

Some 200 mi. to the west, just inland from Lake Erie, other interests are said to be contemplating a similar search, for a large area has been optioned at fancy prices by parties whose names have not been disclosed. Iron has not even been mentioned officially by anyone, but the inference is logical as the optioned ground covers another deep-seated anomaly disclosed by aerial survey.

In both of these areas, mining at present is quite unknown. The Port Hope area is principally dairy country, while the big source of wealth in the Lake Erie field (adjacent to Simcoe) is tobacco. Incidentally, anybody who has sub-aqueous talents might try them out in Ontario. One of the best-looking anomalies yet encountered lies under Lake Ontario, 3 mi. out from Port Hope.

★Ontario's next base metal mine will start production next month, lead-zinc ore from **Matarrow Lead Mines** being scheduled to start flowing through the Matachewan Consolidated mill by mid-July. Matachewan, a Ventures subsidiary, has financed the project since last summer on a basis whereby the two companies will divide profits 50-50 after repayment of capital outlay. The Matachewan mill, a long-time gold producer, has been partly changed over for base metals treatment, but will continue to handle about 300 tons of gold ore from the Matachewan mine, which is now being operated on a salvage basis.

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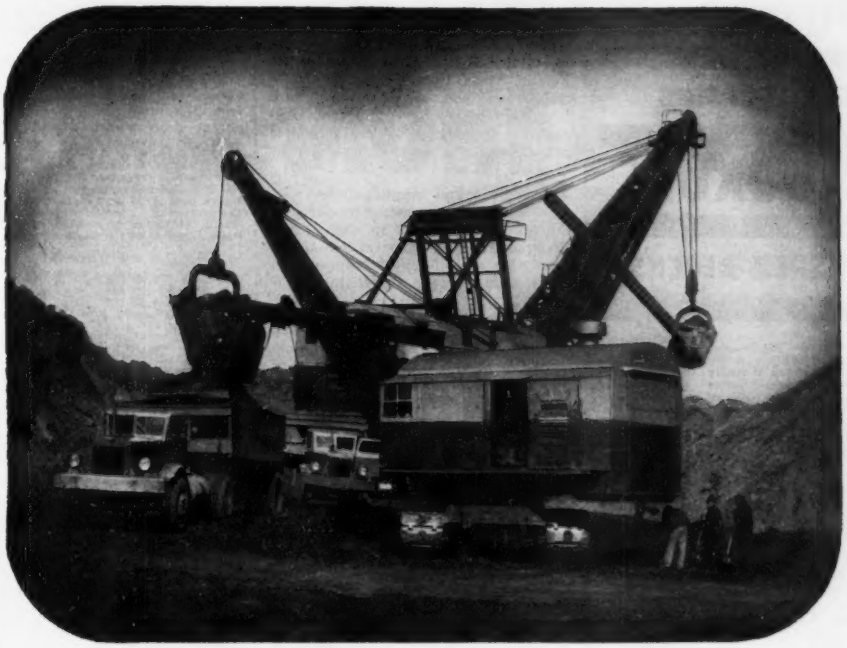

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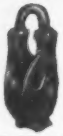

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Canada (*Continued*)

★Encouraging indications have been obtained in the first drilling done by **Headvue Mines** in Northwestern Ontario's Onaman River area, with values in lead, zinc, copper, and silver in evidence.

★Construction of the mill to treat the base metal ore of **Penn-Cobalt Silver Mines** was started last month. It will also handle the company's silver ore, treating the two types separately, and will have a daily capacity of 300 tons to start. Penn-Cobalt holds the former Foster, Penn Canadian, Kerr Lake, and Crown Reserve Mines at Cobalt. Discovery of the low-grade lead-zinc-copper orebody (3.71% combined grade) was the feature development of 1951.

★Geological and magnetometer surveys are under way at the property of **Golden Arrow Mines** in the Boston Creek area, where a modest tonnage of copper ore (13,000 tons averaging 4%) was indicated in the first drilling.

★To speed stripping operations of the Hogarth mine (A orebody), **Steep Rock Iron Mines** has added a second big dredge. The first one, largest of its kind ever to operate in Canada, has been busy for the past 18 months removing clay and silt at the rate of 1.5-million cu. yd. per month. The second one will be ready to start by fall.

QUEBEC

★**East Malartic Mines'** new bottom (16th) level gives promise of becoming the best in the mine to date. Potential looks like 5,200 tons per vertical ft. averaging 0.222 oz. gold per ton, with the east end of the big orebody still open. Encouraged by this new development, the management of this veteran Malartic gold producer has already resumed shaft-deepening to open three more levels, the deepest of which will be 2,935 ft. from surface. Crosscutting is in progress on the 15th level to search for the upward extension.

★Length of 1,150 ft., width about 8 ft., and grade slightly better than 6% can be calculated for the new copper orebody being outlined in the south zone at the Chibougamau property of **Opemiska Copper Mines (Quebec) Ltd.** Much more drilling remains to be done before full possibilities are known, as all intersections to date are at approximately the 275-ft. horizon.

★Drilling news, in this case from underground, has also been heard from **East Sullivan Mines.** On the bottom (1,950-ft.) level a possible new orebody has been indicated in a flat hole to the south from the east drive; 90 ft. of core averaging 1.67% copper, with a 60-ft. center section that ran exactly 2%.

Further flat drilling is in progress, for there are also promising indica-

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tions of new zinc orebodies to be followed up. In the meantime, the shaft will be taken down to establish six deeper levels below the 1,950.

★Another company to make a record showing in 1951 was **Golden Manitou Mines**, neighbor of East Sullivan in Bourlamaque, producing 33-million lb. of zinc, 2.3-million lb. of lead, and 977,000 oz. of silver. Ore reserves rose to 1,766,302 tons. Ore reserves, incidentally, include only material above the 12th level. This year, with development proceeding at five deeper horizons, reserves could increase.

Golden Manitou has a major stake in three outside operations, two of which are starting production this year. Most impressive is a better than 50% interest in **Barvue Mines**, whose 5,000-ton concentrator is just being completed; a 52.5% interest in **Mastodon Zinc Mines**, promising B. C. property with a 150-ton mill in its final construction stages; and a substantial position in **Frebert Mines**, neighbor of Barvue in the Barraute area, where a good tonnage of low-grade zinc-silver ore has been indicated by surface drilling in the westerly extension of the Barvue-Pershcourt zone.

★Production and shaft-sinking plans are progressing together at the **South Chibougamau property of Chibougamau Explorers, Ltd.**, with good time being made as the three-compartment shaft heads toward the 700-ft. horizon. Drill-indicated ore reserves are calculated at 515,677 tons averaging 0.304 oz. gold and 0.76% copper. If underground work confirms this, the mill will have a capacity of 500 tons.

Annual Reports From Canada

QUEMONT MINING CORP., LTD., operating at Noranda, Que., made a net profit of $6.9-million after taxes, up from $5.9-million in 1950. The company produced and treated 772,781 tons of ore averaging 0.155 oz. gold, 1.01 oz. silver, 1.59% copper, and 2.15% zinc. Products of the mill were 60,106 tons of copper concentrate (19-.08% copper); 24,194 tons of zinc concentrate (51.10% zinc); 157,019 tons of pyrite concentrate, which was cyanided to produce 5,888 oz. gold; and 100,176 tons of pyrite concentrate for shipment (47.88% sulphur).

Mining Systems. Horizontal-cut-and-fill accounted for 59.9% of the ore, 36.9% came from sub-level mining; and the balance from development headings.

TORBRIT SILVER MINES LTD., from its mine at Alice Arm, B. C., broke 86,236 tons of ore, but milled 119,711 tons. Average grade milled was 19.398 oz. silver and 0.39% lead. Total reserves at year's end stood at 581,279 tons of 20.0-oz. ore.

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IN AFRICA

★Roy Welensky, leader of the unofficial members of the **Northern Rhodesian Legislature,** issued a statement in May respectfully urging that control of large local mining companies be transferred from London to Northern Rhodesia. He was referring to mines of the Selection Trust group including Roan Antelope, Mufulira, and Chibuluma. Reasons cited were: (1) Great changes are now taking place in Copper Belt labor relations, and control measures should not be administered from "6,000 mi. away;" (2) The political center of gravity has now shifted from London to Northern Rhodesia; (3) Northern Rhodesia is now undergoing a great period of expansion and the mining companies should be available for "day-to-day" discussions by the government; (4) Northern Rhodesia has taken steps to improve its income tax laws by granting enough capital allowances for new mining ventures. Similar allowances are not available under the British tax structure. (5) New capital from the United States would be encouraged by receipt of dividends direct from Northern Rhodesia with its lower tax rate, rather than indirectly through Britain.

★Following on the lead given by other base metal mining companies operating in Southern Africa which transferred head offices from London to areas in which they produce, the **Rhodesian Selection Trust** has applied to the British Treasury to transfer the residence of its copper mining companies to Northern Rhodesia. This covers Rhodesian Selection Trust, Mufulira Copper Mines and its subsidiary, Chibuluma Mines, and Rhodesian Selection Trust (Services).

The other companies moved their headquarters in order to escape British taxation. Reason given for the present move is the emergence in Northern Rhodesia of political and industrial conditions calling for the direction of the companies from within the territory.

★Discovery of what may prove to be **a rich deposit of ilmenite** is reported 25 mi. south of Durban on the Natal coast. Ilmenite occurs in small quantities in the beach sands along most of the Natal coast, but until now there has been no indication of its source.

Consultants from Germany have now advised that the deposit can be exploited economically. The method being used is to pump seawater 300 yd. up the hill containing the deposit and wash the soil down into spiral concentrators designed in this country. The concentrate will be passed through a magnetic separator. The residue contains zircon and rutile which will be handled separately. Large-scale production is planned to start within the next six months, with an estimated output of 30,000 tons of ore per annum. A plan is under consideration for the erection of a pilot plant to produce pigments.

★**Sales of South African** minerals totaled about $31-million for the first quarter of 1952. Major items included: copper, 7,619 tons at about $6-million; tin, 240 tons at $590,000; chrome, 142,565 tons at $1.3-million; manganese ore, 189,554 tons at $2.15-million; blue asbestos, 8,000 tons at $1.56-million; amosite, 13,945 tons at $1.5-million; platinum, $5.8-million.

★**South African gold mining profits** for the first four months of 1952 were about $35-million. Additional revenue from premium gold sales for the first quarter of 1952 amounted to $3.4-million.

★The first 25,000-ton milling units of the **Freddies North and South** mines in the Orange Free State are expected to start up in the third quarter of this year. The second unit, bringing the capacity of the plant to 50,000 tons per month, will be completed by the end of the year.

★**Nchanga Cons. Copper Mines** produced 58,052 long tons of anode and blister copper during the year ended Mar. 31, 1951. Profit was about $14-million. Expansion programs have boosted the present mine capacity to 64,000 long tons of copper per year, and further planned extensions will increase production to 108,000 long tons per year.

★**Chibuluma Mines, Ltd.,** wholly owned subsidiary of Mufulira Copper Mines, has been formed to operate the Chibuluma orebody with indicated reserves of 7.3-million tons running 5.23% copper and 0.25% cobalt.

★**Seven years ago Morocco** was predominantly an agricultural community. Since then many new industries have sprung up including mining and metallurgical projects. Here are some important examples: Oued el Heimer smelter produced 18,000 tons of soft lead in 1951. A recently completed electrolytic plant produced 40 tons of 97% antimony metal last year. Other new plants include three steel foundries, 29 iron foundries, and 10 nonferrous foundries. Morocco has an electrolytic aluminum plant with 500-ton-per-year capacity. The electrical industry has a wire drawing mill with annual capacity of 2,000 tons of bare wire and 7.8-million meters of insulated wire. Three plants are capable of turning out 38,000 batteries and 75 tons of plates per year. Existing plants are producing 40,000 tons of sulphuric acid and 110,000 tons of superphosphate per year, of which 2,500 tons of acid and 50,000 tons of superphosphate are for home consumption. The balance is exported to Britain and the Far East.

★Associated Press reported on June 3 that "The British Government dis-

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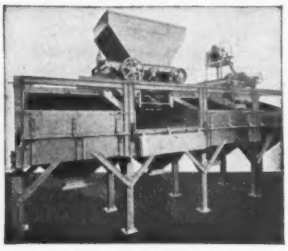

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closed that one of the **world's biggest deposits of uranium** has been discovered in the north central part of Nigeria." *The Financial Times*, London, cited preliminary engineering estimates which assumed that operation of a 3,000-ton plant would yield 100 tons of uranium and 2,000 tons of niobium annually from this source, assuming 75% extraction. The mineral pyrochlore containing uranium and niobium is said to be present in extensive granites in this area.

These news reports are based upon a recent report by the Geological Survey of Britain on "The Albite-Riebeckite-Granites of Nigeria." It states that the most interesting deposit is at Kaffo, which covers 195 acres averaging 0.012% U_3O_8, determined chemically, and 0.26% $(Nb,Ta)_2O_5$, chemically determined. The mineral pyrochlore contains about 3.1% U_3O_8, 3.3% ThO_2 and 41.1% $(Nb,Ta)_2O_5$. It should be noted that pyrochlore is only a minor accessory mineral. The report makes no outright recommendation that this deposit would be commercial. It cautiously calculates, however, what values might be recovered if 3,000 to 5,000-ton plants were to operate on this deposit with recoveries of 50 to 90% of the valuable minerals. In the preface of the report, W. J. Pugh, director of the Geological Survey and Museum, points out: "If extraction difficulties should be solved, a large and important source of uranium and niobium becomes available" to the U.K.

IN EUROPE

★Representatives of a large number of Danish concerns as well as Norwegian, Swedish, and Canadian companies have been invited to Copenhagen to discuss the possibility of establishing **a lead-mining company in Greenland.** The meeting was held at the Danish Ministry of Home Affairs.

★**Sweden's iron ore exports** were 2,909,000 tons in the first quarter of 1952, compared with 2,605,000 tons for the same period last year. Exports of iron and steel were 35,400 tons. Iron prices on the home market increased approximately 8% during the first quarter.

★**Germany and Japan** are competing for a share in the development of India's iron industry by supplying machinery and technicians for a new pig iron plant to be set up in Orissa. The German firm of Krupps has recently sent a delegation to India with proposals. Japan may be favored because it will need to import Indian ores as well as supply machinery to India, whereas Germany cannot afford to import Indian ores over the costly water haul from India to Germany.

★A new **Yugoslav magnesite deposit** said to be sufficient to fill all her needs and have some over for export is re-

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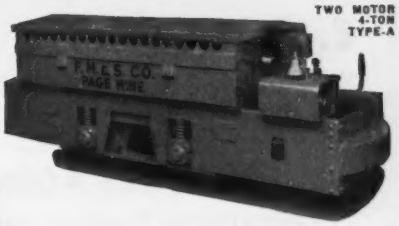

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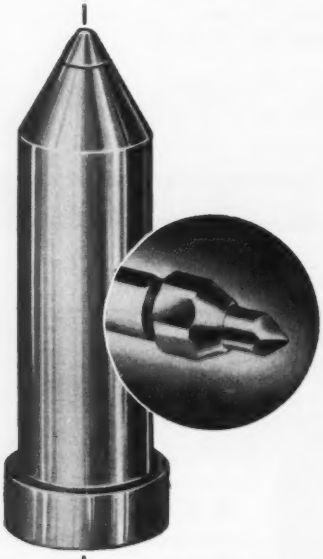

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Europe (*Continued*)

ported to have been discovered in Serbia. Discovery of a large chrome deposit in Serbia has also been reported.

★**A new aluminum factory** is to be erected shortly near the new power plant at Inota, 100 km. southwest of Budapest.

★A West German firm, CHEMIMPEX Gmbh, Frankfurt, has contracts to import raw phosphate from a Jordanian mining company. The first delivery of 2,000 tons will serve for test purposes. An Italian firm, SFIOR, has also contracted to produce about 300,000 tons of Jordan phosphate per year (See *E&MJ*, May, 1952, p. 170).

IN LATIN AMERICA

★**Companhia Industria e Comercio de Minerios S.A.**, of Brazil, announces that by the end of 1952 it expects to be mining manganese deposits at Macapa. An output of 300,000 tons per year is expected for the first few years of operation. Later, this will be stepped up to 500,000 tons per year. The company has signed a contract with Bethlehem Steel Co. for sales of part of the output. The manganese deposits of Macapa, estimated to contain more than 20-million tons, were discovered 10 years ago.

★For the first time **Colombia is going to have a lead mine.** A small company, Compañia de Metales Industriales has started production at Ubala. New modern equipment is being purchased in the United States with which the company expects to extract ore at the rate of 200 metric tons of ore per month which should yield about 10 metric tons of lead per month.

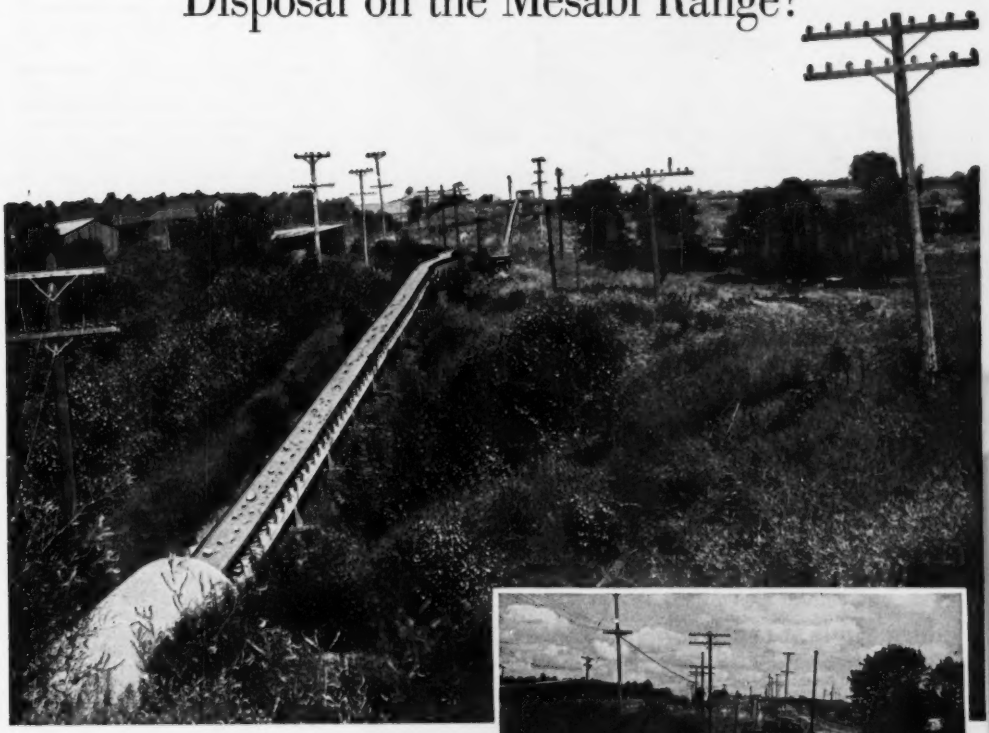
MEXICO

★**Declining lead prices** have prompted the Mexican Chamber of Mines, headed by Gustavo P. Serrano, to urge the government to revise the mining taxation system. It has been advised that fixed levies on metals be abolished, and taxes on profit be imposed on only those operations showing profits. The Chamber also advocates more aid and protection for small-scale producers working low-grade orebodies. Mining now pays 25% of its gross receipts in taxes.

★**Finance Minister Ramon Betata** insists that cheaper silver will not affect Mexican mining because of the Bank of Mexico's skill in buying and selling silver in such a way that the national economy and silver producers are fully protected.

★As of May 26, the Ministry of National Economy announced that there were **16,000 mining franchises active** —800 more than a year ago. During

What's U. S. Rubber doing for Overburden Disposal on the Mesabi Range?



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Large photo shows versatility of U.S. Giant Style XN Conveyor Belt carrying "overburden" over and under Mesabi contours. Small photo shows close-up of this 2000 ft. center belt. Notice troughability and perfect belt alignment.

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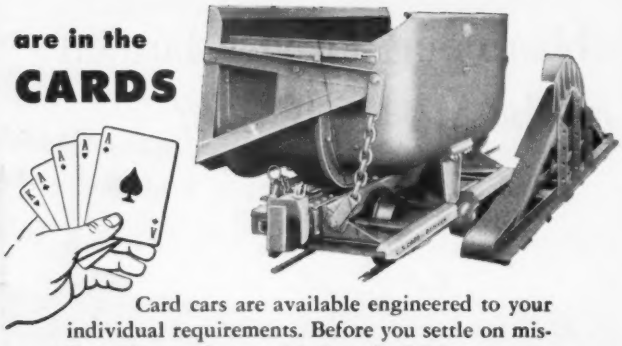

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Latin America *(Continued)*

the year ended May 26, 2,500 permits had been granted to work abandoned properties, resulting in the restoration and full operation of 250 properties.

★**Fundidora de Hierro Veracruzana, S.A.**, has completed an iron and steel works near Vera Cruz. Adolofo Cortines (presidential candidate now busy electioneering), who greatly aided this enterprise, will formally open the works.

★**Mexico's yearly sulphur production** is expected to reach 1-million tons. Future annual output is expected from the following sources. Woodley Petroleum's plants at Coatzacoalcos and Jaltipan (Vera Cruz), 500,000 tons; Petroleos Mexicano's Poza Rica oil field plant, 160,000 tons; and Petroleos refineries at Atzcapotzalco (Mexico City) and Ciudad Madero (Tampico), 200,000 tons. Petroleos has shipped 3,500 tons of sulphur by sea to Canada, largely in exchange for newsprint to Mexico.

CARIBBEAN

★**Cuban manganese ores** which cannot now be exploited commercially will be treated in a $60,000 pilot plant employing the Swan process. The state will bear half the cost, and the Agricultural and Industrial Development Bank the remainder. Negotiations with Mr. Swan will begin at once so that the plant installation can begin without delay.

★First commercial shipment of **Jamaican bauxite** arrived in Mobile, Ala., early in June for use at the Reynolds Hurricane Creek, Arkansas, plant. Reynolds metallurgists have worked out a process whereby the Jamaican ores can be blended with the Arkansas ores thereby increasing the life of the Arkansas reserves. Initial production from the Reynolds Jamaica project will be about 750,000 tons a year.

Reserves on the island are estimated to exceed 300-million tons. **Aluminum, Ltd., of Canada,** is now installing a $40-million mining and alumina-production project, and **Kaiser Aluminum & Chemical Co.** expects to be shipping 1-million tons of ore annually starting this fall.

JAPAN

★**The Japanese Finance Ministry** is opposing the plan for cooperation between the Nippon Light Metals Co. and Aluminum, Ltd. of Montreal which would involve a large investment of foreign capital in Japan. Reasons cited are: (1) to give 50% of the shares to Aluminum Ltd. would mean placing the largest Japanese aluminum producer under complete control of foreign capital. (2) The transfer of these shares at the proposed 60-yen-

per-share rate when the market rate is 120-yen-per-share would not be "appropriate." (3) Transfer of half the company's stock would deprive it of the right to protest in case the Canadian company decided to curtail or stop operations of the Japanese company in a weak market.

★**Japanese production** in April was as follows: electrolytic copper, 8,410 tons; electrolytic zinc, 4,551 tons; electrolytic lead, 1,504 tons; and refined zinc, 1,767 tons.

AUSTRALIA

★Increased interest of **U. S. private investors** in the Australian gold mining industry has been reported recently. Any moves will await present talks on the abolition of double taxation. It is also possible that the Australian Government may offer private investors incentives to stimulate the gold mining industry. Reasons for increased interest are: (1) Sale of total Australian gold output at "premium" prices. (2) Abatement of Australian inflation. (3) Easier manpower situation in gold mining. U. S. interest may also spread to three Melbourne-controlled Fiji gold companies.

★**Exports of lead increased** from 66,000 tons during the first nine months of the 1950-51 period to 82,000 tons for the first nine months of the 1951-52 period. In the same periods exports of zinc increased from 82,000 tons to 83,000 tons.

★**Huge deposits of scheelite** are reported to be located between Bullfinch and Southern Cross. Surface tailings piles on the old Fraser's gold leases have been examined, and in one lease 200,000 tons of tailings were found, averaging .08% scheelite.

★**Great Western Consolidated** is expected to develop into Australia's largest gold producer. Production will begin late this year at about half the mill's rated capacity of 400,000 tons per year. Most of the early ore will come from the open cut. Reserves of open cut ore are estimated to be 790,000 tons averaging 3 to 4 dwt.; and 1,300,000 tons of underground ore averaging 5½ dwt.

★**Galena Lead N.L.** reports that assays of three drift samples ran 17.1%, 22.02%, and 18.45% lead. Pumping troubles are slowing development.

★**Rum Jungle Uranium.** It is possible that one or more private American firms will participate in the exploitation of the extensive uranium deposits in Northern Territory. Reliable sources indicate that Australian-mined uranium have already been sold to the U. S. at "very good prices." The Australian Parliament has recently passed an atomic energy bill giving the Commonwealth full control over the production of uranium for defense and industrial purposes. If and when the

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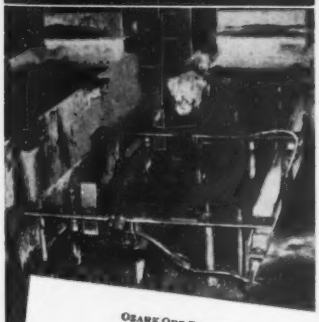

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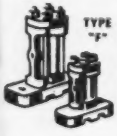

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Australia (*Continued*)

Rum Jungle mining project starts, it will be subjected to strict security blackout.

★**Tasmania Tungsten Developments, N.L.,** has been formed to work mining leases held by Moina Tungsten Tin Syndicate. A large tonnage of 2% ore has been proved.

★**Aberfoyle Tin, N.L.,** is starting a large development program to increase output of tin and wolfram ores. Shaft sinking should start soon.

★**Victorian Antimony Mines, Ltd.,** will install a plant to recover antimony and gold from ores. Samples have yielded 21.3 to 60% antimony and good gold values.

★**North Broken Hill** is earmarking large sums for purchase of a new plant and mine development. About $7 million will finance preparations for mining huge orebodies at depth north of present workings.

★The political situation in Malaya is stimulating development of local tin resources, and the Maranboy field could become a major tin field as a result.

★**Pioneer Scheelite** has started production at the Pioneer Mine. A millhead average of 2½% WO_3 is anticipated.

FIJI

★Three operating gold mines, **Emperor, Loloma, and Dolphin,** have announced a joint $500,000 program to explore 14,000 acres adjoining existing mines in Fiji. Geologic surveys will be followed by churn drilling. Encouraging values have recently been discovered by churn drilling in the eastern section of the Emperor lease. Surface indications in the new area suggest possibility of values below the mudstone formation covering a large part of the Tavua Basin.

★Over 80% of **Fijian manganese** production is imported by Japan.

Corrections

Orquima S. A. is a 100%-Brazilian-owned firm operating a plant at São Paulo which processes monazite produced by Orquima and other companies. *E&MJ* erroneously reported in March, 1952, that Orquima was a subsidiary of the French firm Societe des Terres Rares. Orquima is not a subsidiary, but merely uses a process of the French firm under an international royalty agreement.

E&MJ, May, 1952, erroneously stated that Compañia Minera Canza was owned by Mauricio Hochschild & Co. The Hochschild firm buys the production, but does not own the property.

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NEW BOOKS

Theoretical Petrology. A textbook on the origin and evolution of rocks by Tom F. W. Barth, professor, Geological Museum of History, Oslo, Norway. Dr. Barth presents the current status of our knowledge in all fields of petrology—covering igneous, sedimentary, and metamorphic rocks. The text is a comprehensive scientific study of the rock-making processes, and an interpretation and synthesis of existing quantitative data. The field data comes from all over the world, the geophysical and geochemical data from laboratories, and the theoretical data from research workers in geology, chemistry, and physics. As will be expected, much of the text revolves about phase-law discussions. Nevertheless the book is not ultra-technical and will serve to acquaint the average student with some higher concepts of rock-forming processes and their products. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Pp. 387. Price $6.50.

Introduction to Geophysical Prospecting. By Milton B. Dorbin, senior research technologist, Field Research Laboratories, Magnolia Petroleum Co., Dallas, Texas. This book presents an up-to-date coverage of the following geophysical methods: gravity methods, including use of the torsion balance, the pendulum, and the gravimeter; magnetic prospecting, including use of airborne and other types of magnetometers; seismic reflection and refraction methods; electrical prospecting methods; radioactive prospecting methods; geophysical well logging; and current research in geophysical prospecting. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. Pp. 435. Price $7.

Graphic Aids in Engineering Computations. By Randolph P. Hoelscher, Joseph N. Arnold, and Stanley H. Pierce. A new text covering the following graphic aids: standard slide rules, empirical equations from engineering data, alignment charts, graphical calculus, alignment charts with determinants, special slide rules, and movable-scale nomographs. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. Pp. 197. Price $4.50.

Quarrying Stone for Construction Projects. By I. H. Streefkerk, civil engineer. This book describes current practice in commercial quarries in the U. S. A., and is written especially for civil engineers as an aid in the planning of operations in quarries for construction projects requiring stone for concrete aggregates, breakwaters, etc. The book makes liberal use of DuPont's Blasters Handbook and other current literature on quarrying. For sale by Van Riemsdyck Book Service, Inc., 207 East 37th St., New York 16, N. Y. Pp. 159. Price $5.

Quality-Control Handbook. A compilation of 15 chapters prepared by 10 different authorities on the respective phases of quality control. Edited by J. M. Juran, consulting management engineer. Quality control is the logical and scientific approach to the solution of problems not only in the manufacturing field, but also in mining, milling, and smelting. To young engineers who want to distinguish themselves by solving practical problems the modern way, and for veteran operators who want to handle milling and other problems by a fast-growing, unique, and effective technique, we suggest that a study and application of quality-control methods will be very helpful. To find out what quality-control is all about, refer to your July, 1951, issue of *E&MJ*, pp. 126 to 129, inclusive, "How To Use Quality Control To Improve Mill Production," by Adrian C. Dorenfeld and Morton H. Dorenfeld. These authors conclude by suggesting "that anyone interested would do well to make a serious study of the mathematics and technique of quality control." The Quality Control Handbook offers you that opportunity. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. Pp. 800. Price $10.

The Utilization of Low-Grade Domestic Chromite. By K. W. Downes and D. W. Morgan, Mineral Dressing and Process Metallurgy Division, Department of Mines and Technical Surveys, Mine Branch, Ottawa, Canada. Includes unpublished results obtained by Hudson Bay Mining & Smelting Co., Ltd., from roasting and leaching experiments; oxidation to chromate and reduction with carbon; leaching in sulphuric acid; and cost estimates. Pp. 54.

Modern American Engineers. By Edna Yost. An inspirational text for young people planning to enter the engineering field. Chapters are written about the following famous engineers: Robert E. Doherty, Ralph E. Flanders, Arthur E. Morgan, Vannevar Bush, Scott Turner, J. Brownlee Davidson, Harold B. Maynard, Ole Singstad, John R. Suman, Carl G. A. Rosen, Stanwood W. Sparrow, Harold A. Wheeler. Published by J. B. Lippincott Co., East Washington Square, Philadelphia, Pa. Pp. 182. Price $2.50.

Heat and Thermodynamics. New Third Edition. By Mark W. Zemansky, professor of physics, City College of New York. The first ten chapters deal with fundamentals including the concept of heat, temperature, internal energy and entropy, and the first and second laws of thermodynamics. The remaining nine chapters cover physical, chemical, and engineering applications. Many chapters have been revised and expanded, and 65 new figures and 60 new problems have been added. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. Pp. 465. Price $6.

Finite Deformation of an Elastic Solid. By Francis D. Murnaghan, Instituto Tecnologico de Aeronautica, Brazil. An advanced mathematical text covering vectors and matrices, the specification of strain, the connection between stress and strain, isotropic elastic media, non-isotropic elastic media, simple shear and tension, and particular problems. Published by John Wiley & Sons, Inc., New York, N. Y. Pp. 140. Price $4.

Metallizing Handbook. A profusely illustrated handbook covering the technical and practical aspects of metallizing. Methods of surface preparation and the application of metallized coatings for machine element work, for corrosion work, and other special jobs are thoroughly detailed. The handbook is the result of nearly 20 years of experience in the design, manufacture, and use of metallizing equipment. Published by Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y. Pp. 250. Price $3, postpaid in the U. S. and Great Britain only.

The Authority of the Nation Over the Mineral Wealth of the Ground and Subsoil. In Spanish. A thesis by Eduardo Terrones Langone. National University of Mexico, Mexico D.C. Pp. 144.

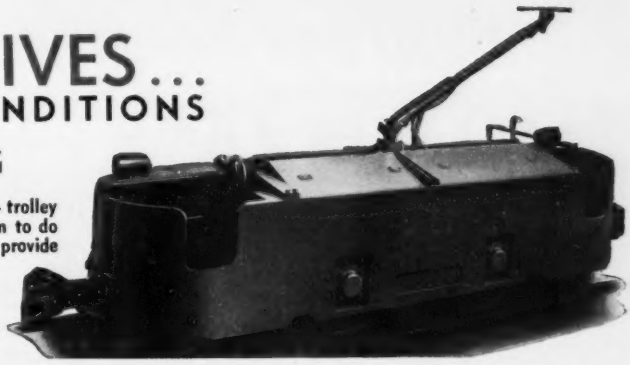
Practical Industrial Electronics. By F. A. Annett, associate editor, *Power*. This book was written for the operating engineer or electrician who is not an electronic expert, but who would like to know more about the "why" and the "how" of electronic tools. It covers the field from a practical point of view, but shows proper regard for the importance of theory. Initial chapters deal with principles and basic devices: Electron theory; electron tubes; reactors and capacitors. Later chapters describe, with circuits and applications, many of the more complex devices that are common to mining, milling, and smelting: Liquid-level and pump controls; speed controls for a-c and d-c motors; smoke indicators (for fire protection); rectifiers; amplifiers; voltage controls; and many more. McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. Pp. 381. Price $6.

LOCOMOTIVES...
TO MEET ALL CONDITIONS
IN METAL MINING

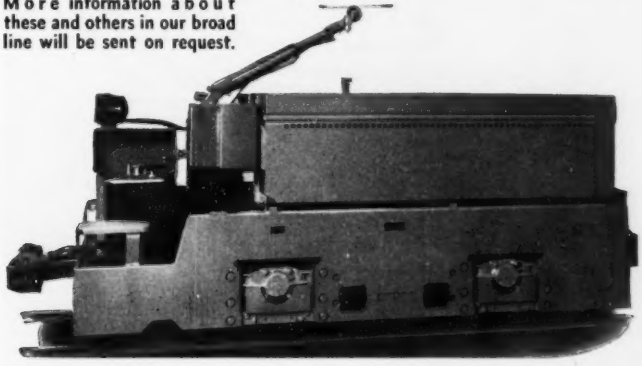
We build a complete line of locomotives — trolley and storage battery types. We design them to do the job . . . to meet all conditions and provide economical transportation.

Haulage, gathering or trammer locomotives with all the features that over fifty-five years of study can possibly put into them. Experience is still a good teacher and Jeffrey Engineers have an ample supply of that as evidenced by hundreds of successful installations.

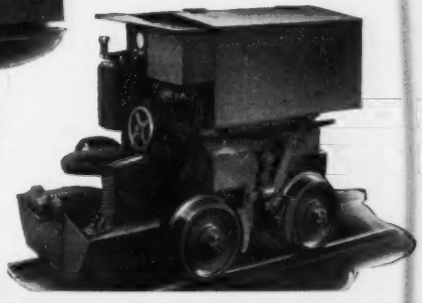
For haulage and tramming in the Metal Mine we show three types on this page. More information about these and others in our broad line will be sent on request.



Jeffrey 6-ton, round-end Trolley Locomotive with two 30 H. P. motors. 24" gauge; 33" wheels; 54" height with trolley pole locked down; length is 13'8"; width 46" and wheel base 48". This is a neat, compact job for handling your haulage operations



The Jeffrey Trammer (below) is a 1½-Ton compact unit—can be arranged for trolley, storage battery or cable reel operation. Has a 6 H. P. motor; short wheel base (only 26") to take sharp curves; compact construction to meet gauges down to a minimum of 18"; water tight construction; operator's deck can be removed to shorten length for entering cage.



Jeffrey Storage Battery Locomotive — 12,000 pound chassis and 30" gauge. Two 30 H. P. motors—two-rate battery charging from trolley—60" high with trolley locked down; wheel base 56"; length 7'2"; width 52". This combination trolley and storage battery locomotive will give you years of service under the severest conditions.

OTHER JEFFREY EQUIPMENT:

Bucket Elevators
Bin Valves
Conveyors
Car Pullers
Feeders
Stackers (belt)
Idlers (belt)
Crushers
Pulverizers
Dryers
Coolers
Transmission Machinery
Chains
Magnetic Separators
Grizzlies
Shuttle Cars
Weigh-Feeders

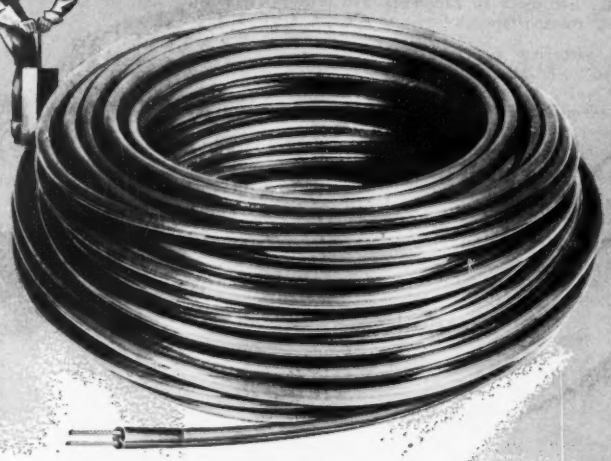
THE JEFFREY MANUFACTURING COMPANY
ESTABLISHED 1877
974 North Fourth St., Columbus 16, Ohio

1877 75 1952

NOW! THE TOUGHEST SHOT FIRING CABLE EVER PRODUCED!

Check the long life qualities offered by this *SUPER DURABLE* SHOT FIRING CABLE

- RESISTS SHARP EDGES AND ABRASION
- FLAME RETARDING AND WATERPROOF
- NON-DECAYING AND NON-AGING
- HIGH STRENGTH AND FLEXIBILITY
- NON-CRACKING FROM −40°C to +80°C
- RESISTS MOST ALKALIS, ACIDS, OILS, GREASES
- IMMUNE TO OZONE AND SUNLIGHT



Exclusive CHESTER nylon jacket over center core increases service life and promotes mine safety

Here's the shot firing cable you can depend on for really tough mine service. It's highly durable when exposed to sunlight and ozone, withstands dragging over sharp edges and abrasives and is highly flexible. Non-cracking over a wide temperature range, Chester is flame retarding and waterproof—the kind of cable that's good for years of usefulness in all types of mining operations. Ask for Chester the next time you order — you'll agree, IT'S THE TOUGHEST SHOT FIRING CABLE EVER MADE!

Call or write for complete data and samples

CHESTER MINE-SERVICE TELEPHONE WIRE
For rugged installations. A flame-retarding, non-decaying waterproof wire offering high tensile strength. Resists acids and extreme temperatures.

CHESTER NEW IMPROVED BLASTING WIRE
For extra dependability and long service life. Completely waterproof construction, features high mechanical strength. Covering is flame retarding.

CHESTER CABLE CORP.
CHESTER, NEW YORK

MANUFACTURERS OF QUALITY WIRES AND CABLES FOR EVERY INDUSTRIAL AND COMMERCIAL APPLICATION

Mud and Mountains are HYSTAWAY'S Dish

Exclusive HYSTAWAY® Design Advantages Pay Off for Pipeline Contractors

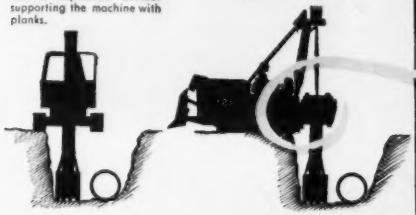
Not only was mud and rough mountainous terrain a problem contended with on the pipeline job shown, but in some instances trench excavation had to be accomplished by positioning the machines at right angles to the ditch. (Straddling in the conventional manner was not possible without shoring up, which is costly and time consuming.)

The Hystaway is capable of full production digging in this position and it is the only excavator-crane designed to swing the boom from a point to the rear of the tracks.

The diagram compares the Hystaway swing design to full revolving machines.

OTHER POWER SHOVELS
The method illustrated below is impossible without supporting the machine with planks.

HYSTAWAY
No planking or other supports are needed.

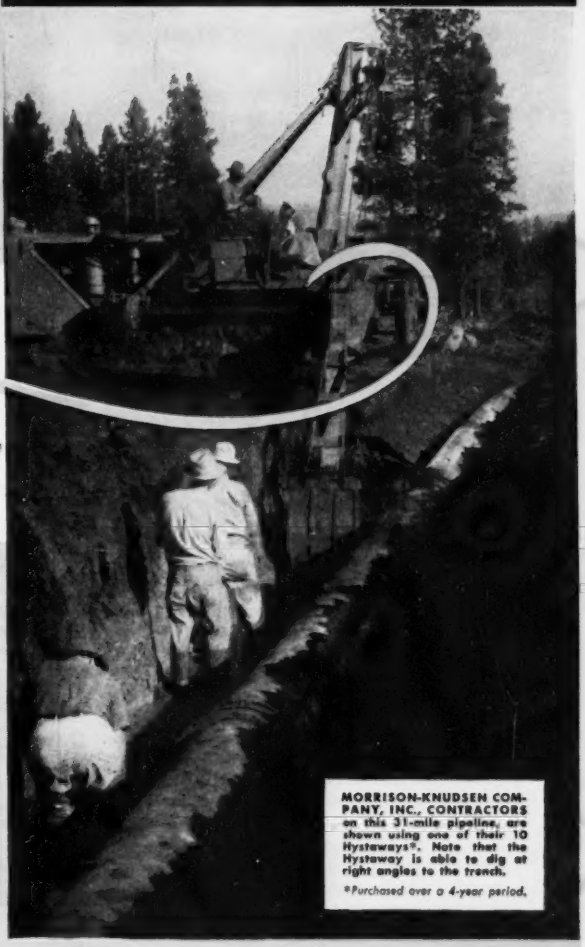


In addition, because the Hystaway mounts on a Caterpillar Track-type Tractor it combines high production excavator-crane work, with full tractor mobility and maneuverability. This permits moves to be made at tractor speeds, through mud, over rocky, mountainous terrain; also makes it possible to get into jobs *unassisted*, work in places inaccessible to other excavators.

The Hystaway can be equipped to operate as a Backhoe, Shovel, Dragline, Clamshell, or Crane. Controls and other operating features are similar to standards set for half-yard excavators.

The Hystaway mounts on Caterpillar D8, D7 and D6 tractors. After initial installation, mounting can be accomplished in approximately 1 hour and demounting in ½ hour. Removal of the Hystaway frees tractor for normal bulldozing, other jobs.

See your Caterpillar-Hyster dealer, or write for literature.



MORRISON-KNUDSEN COMPANY, INC., CONTRACTORS on this 31-mile pipeline, are shown using one of their 10 Hystaways®. Note that the Hystaway is able to dig at right angles to the trench.

®Purchased over a 4-year period.

HYSTER COMPANY

2965 N. E. CLACKAMAS STREET....PORTLAND 8, OREGON
1865 NORTH ADAMS STREET.....PEORIA 1, ILLINOIS

HYSTER

"Carlon won't Corrode!"

"Amazing pipe, that CARLON! We've used it to handle wastes so corrosive they quickly eat through metallic pipe—but even after years of service, CARLON's as good as new. It just won't corrode!"

CARLON is the only pipe that is guaranteed against rot, rust and electrolytic corrosion. It features absolute resistance to the chemical attack of sulphurous waters, alkalies, and metallic salts. Permanent free-flow is assured by the smooth internal surface which will not accumulate scale or sediment.

CARLON plastic pipe is lightweight . . . flexible . . . can be installed quickly without special tools or rigging equipment. Furnished in long lengths which conform to irregular surface contours, it requires fewer fittings.

Recommended applications include drinking water and drainage systems, ventilating lines, hydraulic sluicing, intake and exhaust piping, dredge discharge lines, low-pressure air lines, etc.

NOM. SIZE	O.D.	I.D.	EST. BURST P.S.I.	WT. LBS. PER FT.	SHPG. LENGTHS
½"	0.840	0.622	540	0.103	400 ft. coils
¾"	1.050	0.824	350	0.140	400 ft. coils
1"	1.310	1.070	200	0.181	300 ft. coils
1¼"	1.660	1.380	200	0.267	300 ft. coils
1½"	1.900	1.610	200	0.320	250 ft. coils
2"	2.378	2.070	170	0.445	200 ft. coils
2½"	2.875	2.469	170	0.680	200 ft. coils
3"	3.504	3.070	165	0.910	100 ft. coils
4"	4.504	4.030	150	1.250	25 ft. str.
6"	6.630	6.070	115	2.230	25 ft. str.

Identification Stripe: WHITE—Standard Pipe
RED—Heavy-duty Pipe

CARLON CP 562-CP

Specify the Pipe with the Stripe!

Write for Catalogs

CARLON PRODUCTS CORPORATION

In Canada: Micro Plastics, Ltd., Acton, Ontario
10300 MEECH AVENUE • CLEVELAND 5, OHIO

FUMEALL*

TRADE-MARK

the superior filter fabric for fume, dust and liquid filtration

SUCCESS STORY NO. 5!

"Three major smelters now using Fume-All filter fabric exclusively!"

—From correspondence in our files.

***What is* FUMEALL?**

FUMEALL is a combination of virgin wool and synthetic staple fibers. This combination gives the undisputedly superior filtering qualities of virgin wool plus the strength, heat, acid, alkali, and moisture-resistance of synthetic fibers.†

How long does* FUMEALL *last?

In actual operations, **FUMEALL** is lasting 4 times as long (and in many instances much longer) as conventional all-wool filter fabrics.

How much does* FUMEALL *cost?

The initial cost of **FUMEALL** is little more than any good all-wool filter fabric. Yet when measured in terms of longer life and superior performance **FUMEALL** costs far less.

***How resistant is* FUMEALL?**

FUMEALL operates successfully in temperature ranges far beyond those permitted by conventional all-wool filter fabrics (225° to 300°), has greater fire-resistance than most synthetics. In intermittent operations, moisture absorption of **FUMEALL** is 50% or less than that of conventional all-wool filter fabrics, and shows greater resistance to acids and alkalis present in various filtered fumes and liquids.

***What is the porosity of* FUMEALL?**

You can get exactly the porosity you want with **FUMEALL**, the right weave for your specific requirements. At present, **FUMEALL** is available in 4 different weights from most porous 14-oz. to least porous 24-oz. Finer or coarser weaves are available on special order, and **FUMEALL** can be napped or unnapped to conform to various operating conditions.

What about* FUMEALL *sizes?

FUMEALL is "tailored to your needs". Portland Woolen Mills will weave yardage or fabricate bags to any size and specification.

FumeAll is proving highly satisfactory for vacuum filtration in drum, disc and leaf type filters as well as bag type filters. Write or send coupon for samples and details.

INDUSTRIAL FABRICS DIVISION

Portland Woolen Mills, Inc.

P. O. Box 2620 • Portland 3, Oregon

*Patent pending

†DYNEL—a product of Carbide and Carbon Chemical Division of Union Carbide and Carbon Corp.

Industrial Fabrics Division
PORTLAND WOOLEN MILLS, Inc.
P. O. Box 2620, Portland 3, Oregon

Please send me additional details and samples of **FumeAll** suitable for
☐ fume collection ☐ dust collection ☐ liquid filtration

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____

Norblo
AUTOMATIC
Bag Type Dust Collection

Cutaway shows Norblo basic unit of 78 bags. Automatic shaking and bag cleaning, one unit at a time, insures full use of cloth area better than 99% of the time.

Rugged, Efficient, Economical
. . . *Pays for itself Quickly*

For continuous and heavy duty service at constant capacity and efficiency, Norblo Automatic Bag Type Dust and Fume collection pays its own way—in the recovery of valuable materials or the removal of injurious or "nuisance" industrial air contaminants. Norblo builds the entire installation, from blowers to bag-cleaning mechanisms. Complete systems are engineered to meet specific situations, production layouts and required capacities. Norblo engineering insures low maintenance and no shut-downs—guarantees performance of every installation. Write for Bulletin 164-3.

Norblo also builds centrifugal and hydraulic dust collectors, exhaust fans, cement air cooling systems and portable dust collectors.

THE NORTHERN BLOWER COMPANY

Engineered Dust Collection Systems for All Industries

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an ACCO product

Specify . . .
Hazard LAY-SET Preformed
—the Green Strand brand

• The green strand in a HAZARD wire rope identifies it immediately as LAY-SET Preformed improved plow steel. The green strand is your guarantee that the best materials are used to produce a safer, longer-lasting rope.

Hazard's experience making quality wire ropes goes back to 1846. Hazard's modern research and engineering is constantly at work improving wire processing and manufacturing techniques so that the wire ropes that bear the proud HAZARD brand will continue to be the most economical ropes for you to use.

Specify—and be sure you get—Hazard LAY-SET Preformed . . . the Green Strand brand.

ACCO

TRADE MARK

HAZARD WIRE ROPE DIVISION
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

makers of ACCO Registered WIRE ROPE SLINGS

NI-HARD widely used ...where abrasion is severe

ONE OF THE HARDEST commercial products of the iron foundry is a *nickel-chromium white cast iron* trade-named "NI-HARD*".

HARDNESS RANGE

Its Brinell hardness ranges from 550 to 650 when sand cast, and 600 to 725 when chill cast.

This extreme hardness . . . at the moderate price of NI-HARD . . . provides abrasion resistance at lowest ultimate cost.

STRUCTURE

Unlike other cast irons . . . NI-HARD comprises a multitude of hard carbides firmly embedded in a matrix which is as hard as fully hardened steel. NI-HARD is unmachinable except in special cases. Finishing requirements are met by grinding or the use of cast-in-place machinable inserts.

PERFORMANCE

NI-HARD develops abrasion resistance two to three times better than that of unalloyed white iron. Therefore NI-HARD can economically replace white iron.

NI-HARD lasts one and one-half to two times as long as austenitic manganese or carbon steels, under conditions involving only moderate impact. Chill cast parts are stronger and more abrasion-resistant than comparable sand castings.

STRESS RELIEF

The strength and toughness of NI-HARD castings are increased fifty to eighty per cent, without loss in hardness or abrasion resistance, by a stress relieving treatment at 400-450°F. User experience has demonstrated the merit of specifying this treatment.

APPLICATIONS

Applications include: grinding balls, ball and rod mill liners, slurry pump parts, flotation impellers, piping, scoop lips, classifier shoes, roll heads, pulverizer rings, chutes and hopper liners, muller tires, plows, pug mill knives, clay augers. Also coke grizzly discs, crusher rolls, coal mine pumps, dredge pump impellers, liners, rings and sleeves. Also industrial food grinding burrs and attrition mill plates.

AVAILABILITY

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of NI-HARD for many end uses in defense and defense supporting industries. There are authorized foundries, from coast to coast, equipped to quote you on NI-HARD castings in all common forms and shapes.

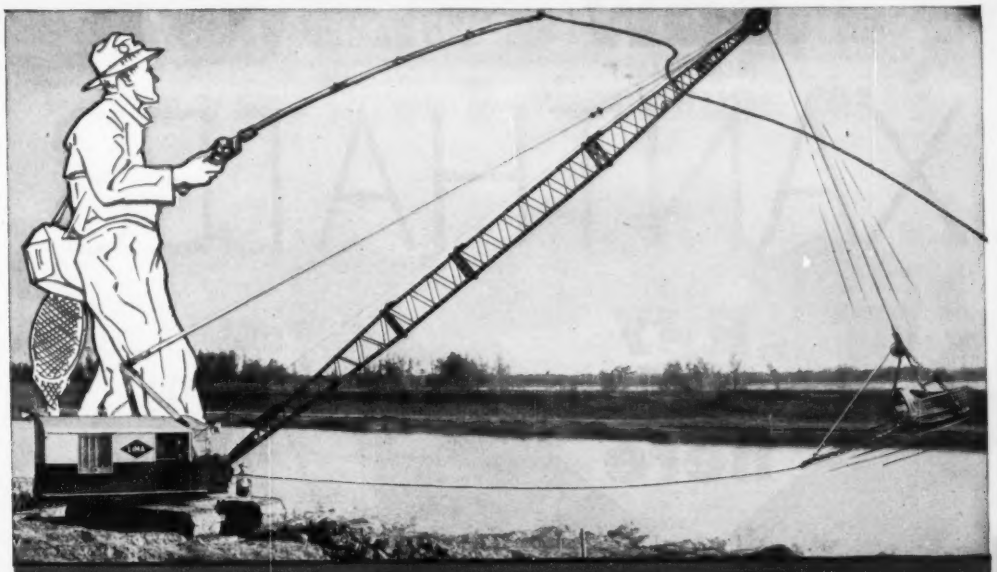
INFORMATION AVAILABLE

Write for the booklets, "Engineering Properties and Applications of NI-HARD", and, "Buyers Guide for NI-HARD Castings."

*Reg. U. S. Pat. Off.

EMBLEM OF INCO SERVICE TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC. • 67 WALL STREET NEW YORK 5, N.Y.



LIMA DRAGLINES use *The Fisherman's Secret* FOR A GOOD CATCH

When you're fishing, and want to drop the bait in the far pool where the big ones are waiting, your reel's got to be *friction-free* to let that line flow out, smooth as cream from a jug. And, after the strike, come in the same way.

When you're after record yardage, a smooth flowing line is just as vital . . . so we took a tip from the fisherman, and made our reels friction-free. You can 'cast' the dragline bucket further, increase your radius of efficient operation from each location. You can bring in bigger catches, because more power is going into the work lines and less into *friction drag on the machinery*. And there's further big benefits from reduced maintenance . . . less frequent lubrication, and smoother operation, because misalignment from bearing wear, that affects clutch alignment and functioning, is eliminated.

Lima pioneered the use of anti-friction bearings at all important bearing points on draglines, shovels, and cranes. They've kept on pioneering with other improvements that put Lima equipment in the top rank of profitable performers. If you want proof of this—just ask the Lima user. If you want details on how to put Lima equipment on your *pay-off* roll . . . just get in touch with us.

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LIMA-HAMILTON DIVISION
LIMA, OHIO, U. S. A.

OFFICES IN PRINCIPAL CITIES OF THE WORLD

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SHOVELS • CRANES • DRAGLINES • PULLSHOVELS • TRUCK CRANES

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(BEAR BRAND)

XANTHATES

in greater concentration and maximum recovery!

Higher concentrate grade with Dow Xanthates makes flotation of sulphide minerals fast and complete—with every froth bubble loaded to maximum carrying capacity. And the extreme selectivity of these superior collector reagents always assures concentrates of good grade. The result is maximum recovery with minimum operational costs. To learn more about Dow Xanthates and the savings they can effect in your milling operation, write to Dow, Dept. OC 26.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

consider these DOW XANTHATES

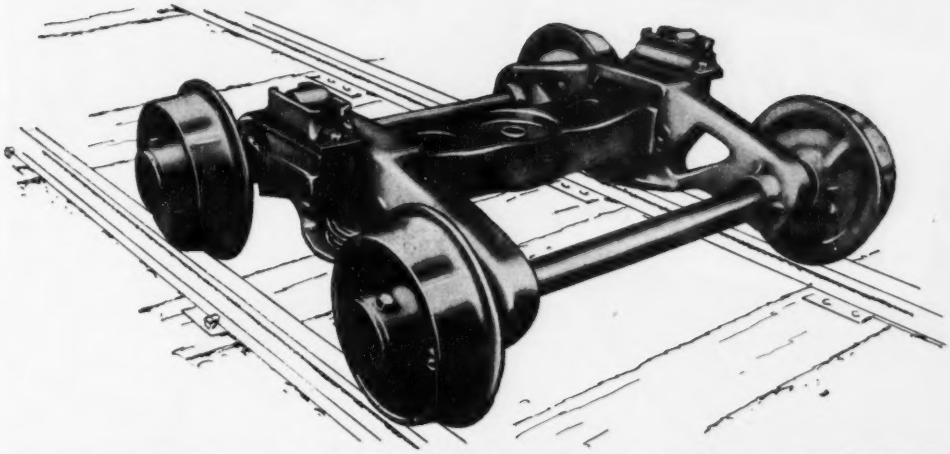
Z-3 Potassium Ethyl Xanthate
Z-4 Sodium Ethyl Xanthate
Z-5 Potassium sec-Amyl Xanthate
Z-6 Potassium Amyl Xanthate
Z-8 Potassium sec-Butyl Xanthate
Z-9 Potassium Isopropyl Xanthate
Z-11 Sodium Isopropyl Xanthate

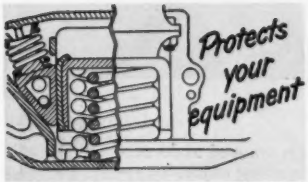
For livelier froth— use DOWFROTH 250

To its desirable characteristics of better frothing, better metallurgy and water solubility, Dowfroth 250 adds economy. In actual mill tests, concentrations *as low as one-fourth of normal concentrations* have proved satisfactory! Use this new frother for a froth that's livelier on the machine, quicker breaking in the launders and pump boxes—write to Dow, Dept. OC 26, for your free sample.

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

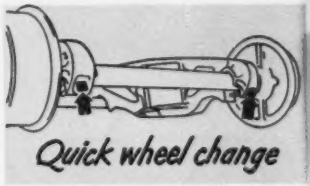
Specify NATIONAL NC-1 trucks for your large 8-wheel mine cars





Shock-absorbing system of the NC-1 truck is similar to designs of the American Association of Railroads for full-size freight car trucks. The oscillation control mechanism (see cutaway) floats your loads over the tracks.

Track irregularities are no hindrance to higher speeds for mine cars when they are equipped with National NC-1 trucks. Truck design and large diameter, low stressed, load-carrying springs improve riding qualities.



Removal of bolt at each end of side frame permits quick wheel and axle assembly change. Cuts repair time and costs . . . keeps cars in operation longer. No lengthy tie-ups for wheel and axle changes on a National NC-1 truck.

The NC-1 truck stays square automatically. V-shaped slots over the axles make it impossible for the truck to get out of square without lifting entire weight of the car body and lading—means longer service, less repairs.

National NC-1 truck's large center bearing provides maximum wear life by reducing per-square-inch loading . . . provides bolster stability. Has easily replaceable centerplate shims and adequate provision for lubrication.

Side frame and bolster are each of one-piece, integrally cast construction similar to the National C-1 trucks used on railroads. Gives maximum strength, minimum weight—has *no welds or rivets to shake loose.*

A-1950

For minimum maintenance time and spillage, plus maximum equipment protection—specify National NC-1 trucks on your next 8-wheel mine car order.

NATIONAL Products FOR TRANSPORTATION AND INDUSTRY Est. 1868

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

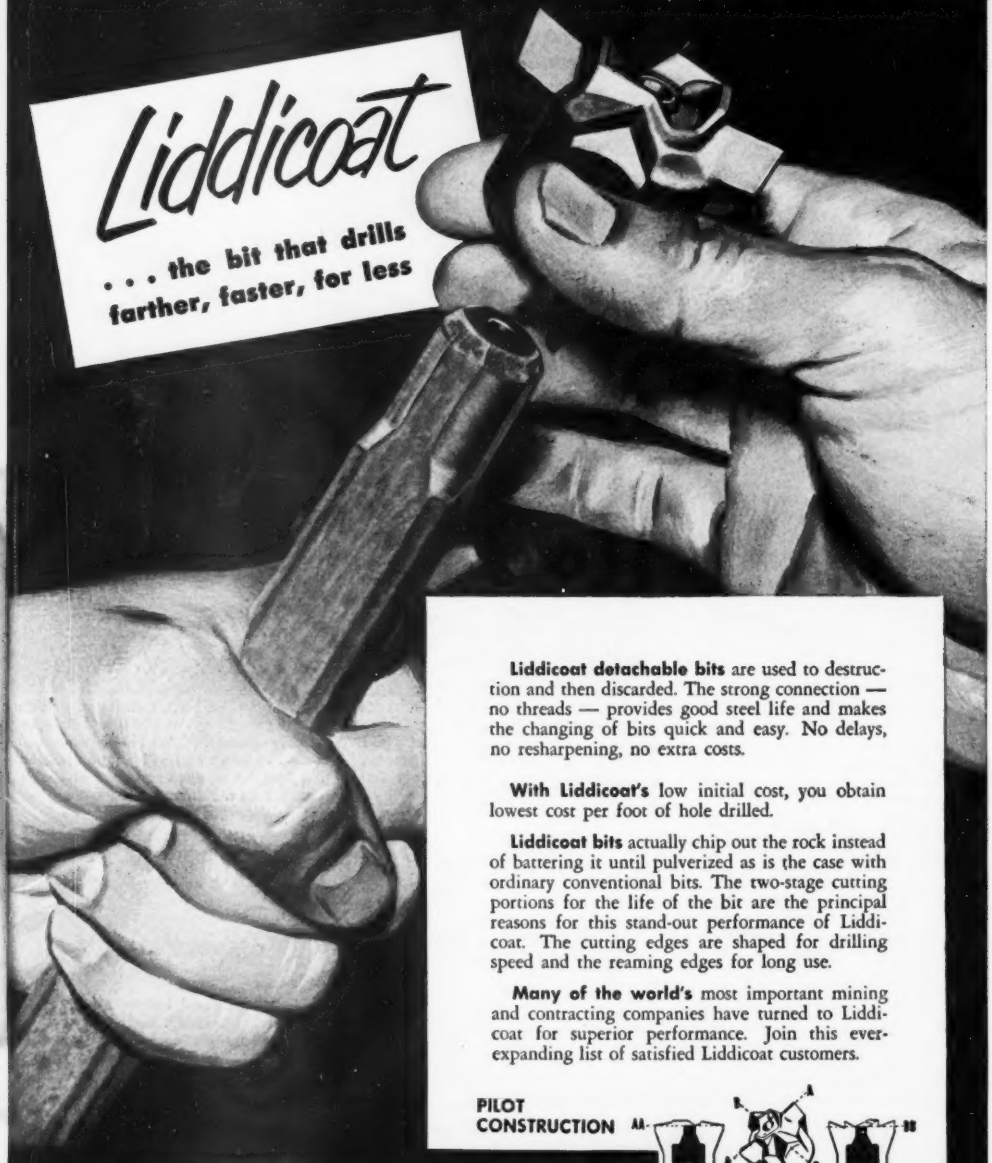
Cleveland 6, Ohio

Willison Automatic Couplers • Friction & Rubber Draft Gears • Car Trucks • NACO Steel Wheels • NACO Steel Links & Swivel Hitchings

USED TO DESTRUCTION...NO RESHARPENING

Liddicoat

. . . the bit that drills farther, faster, for less



Liddicoat detachable bits are used to destruction and then discarded. The strong connection — no threads — provides good steel life and makes the changing of bits quick and easy. No delays, no resharpening, no extra costs.

With Liddicoat's low initial cost, you obtain lowest cost per foot of hole drilled.

Liddicoat bits actually chip out the rock instead of battering it until pulverized as is the case with ordinary conventional bits. The two-stage cutting portions for the life of the bit are the principal reasons for this stand-out performance of Liddicoat. The cutting edges are shaped for drilling speed and the reaming edges for long use.

Many of the world's most important mining and contracting companies have turned to Liddicoat for superior performance. Join this ever-expanding list of satisfied Liddicoat customers.

PILOT CONSTRUCTION

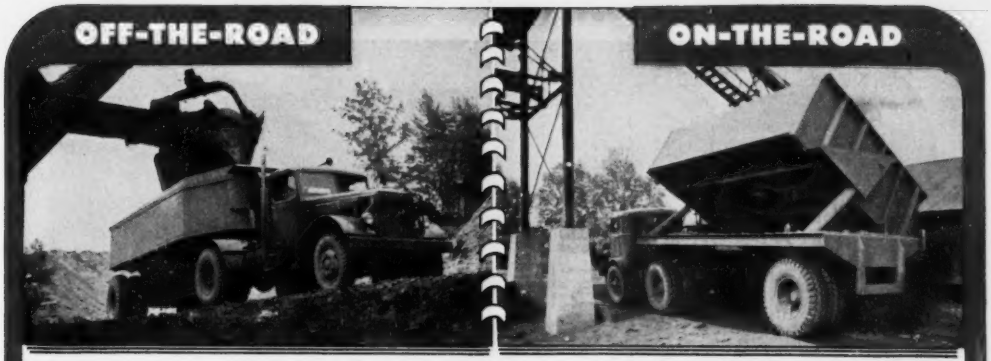
Section "AA", along the high-centre wings. Section "BB", along the low-centre wings.

WESTERN

Rock Bit Manufacturing Company

552 West 7th South • Salt Lake City 4, Utah

EVERY LITTLE BIT COUNTS



GENERALS go in—get the load—carry it out and over-the-highway

FASTER! EASIER! At Lower Cost!

Pile on the tons. The General L. C. M. is built to move heavy loads out over jagged surfaces without cuts, bruises or snags.

Move more tons over the road on this tough, dependable General H.C.T. Longer wearing, safer running, quicker stopping.

THE GENERAL L.C.M.

THE GENERAL H.C.T.

Make Every Worn Tire Work Longer for More Profit!

Your General Tire Dealer will KRAFT SYSTEM RECAP Worn Tires with the New General Truck Tire Tread of Your Choice

KRAFT SYSTEM RECAPPING
A GENERAL TIRE SERVICE

You're throwing away money when you throw away worn tires or accept an ordinary "adjustment" for them. Let your General Tire Dealer—a tire expert—restore worn tires with famous factory controlled Kraft System Recapping. You choose from the complete line of on and off-the-road new General Tire treads and he'll put that tread on your worn tire. He can do sectional repairs too. Get Kraft System Recapping—get more profit from every tire.

SPECIFY GENERAL TIRES ON YOUR NEW EQUIPMENT

HUMBOLDT
Since 1856
Mines Equipment, Mineral Dressing Plants, Crushing and Grinding Machinery, Cement Mill Outfit, Metallurgical Works, Coal Preparation Plants, Steel Constructions for Buildings and Bridges
DEUTZ
Since 1864
Otto-, Gas-, Diesel-Engines for Every Purpose of Two- and Four-Stroke design, Output range 3–1500 H.P. Cooled by water or air, Diesel-powered tractors, Diesel locomotives, Gas producer plants
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Since 1864
Trucks and busses driven by air-cooled DEUTZ Diesel engines, Vehicles for municipal services, Fire ladders, fire engines, Fire fighting water trucks, Two-wheeled ladders, Fire fighting equipment.
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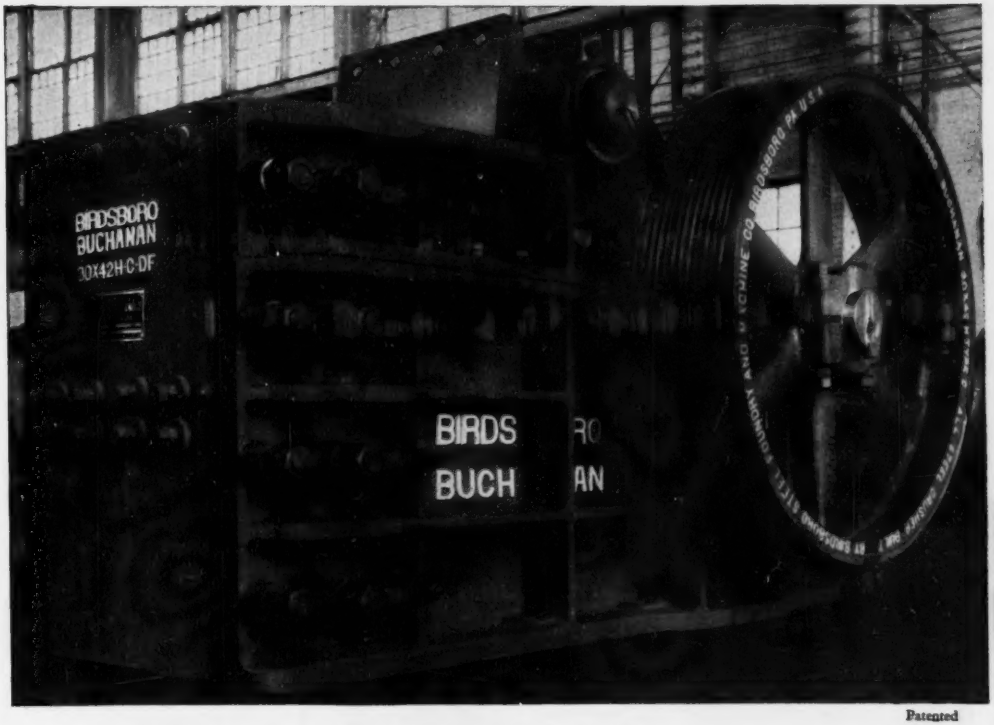
Send inquiries to either Köln, Germany or Ulm, Germany

AN ALWAYS DEPENDABLE CRUSHER



Patented

This 30 x 42 H Type C Deep Frame BIRDSBORO-BUCHANAN JAW CRUSHER

No matter where you install Birdsboro-Buchanan crushers, above or below ground, you can *always* depend on a steady uninterrupted flow of crushed material.

This heavy duty All Cast Steel Crusher was specially sectionalized for underground installation in one of the leading ore producer's plants in the Iron Range where major underground repairs are impossible. The crusher must stand up to the job day in and day out. BIRDSBORO-BUCHANAN engineers have designed and built these crushers for dependable service.

Consult our engineers if you are up against a trying crushing problem.

Canadian Representative & Manufacturer
JOHN INGLIS CO. LTD.
TORONTO, CANADA

World-Wide Agent Representation. Contact home office for nearest representative.

CR-5-49-R

BIRDSBORO
STEEL FOUNDRY & MACHINE CO.
Birdsboro, Penna.

BIRDSBORO BUCHANAN JAW CRUSHERS

Designers and Builders of:
Crushing Machinery • Rolls • Steel Mill Machinery
Hydraulic Presses • Special Machinery • Steel Castings

Are you getting these

Bonus Benefits

of Red-Strand wire rope

QUALITY?

Does your present wire rope *deliver top tonnage*?

Have you considered the extra *labor-savings* resulting from less frequent replacement with Hercules* Red-Strand?

Do you know that these two benefits are top ones with Hercules Red-Strand wire rope users?

Are you getting wire rope that is manufactured with the precise care . . . the exacting insistence upon *higher-than-rated* quality . . . and the specialized craftsmanship that goes into Hercules Red-Strand wire rope?

If you're not sure . . . FIND OUT

It means money to you. Leschen wire rope specialists will help you answer these questions . . . to your profit. There's no obligation. Ask them.

Write for your free copy of "Use and Care of Leschen Wire Rope."

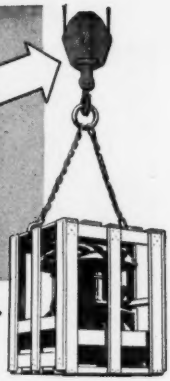
A. LESCHEN & SONS ROPE CO.
St. Louis 12, Missouri
DISTRIBUTORS IN ALL PRINCIPAL CITIES

In business only to make wire rope — better wire rope — since 1857.

*Reg. U. S. Pat. Off.

Preformed • Round Strand • Flattened Strand • Non-Rotating • Locked Coil • Slings

What's the capacity of this block?



If you don't know.. *don't use it!*

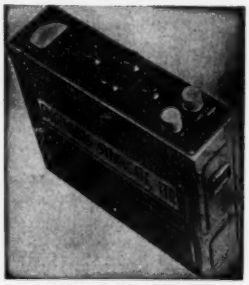
Specify
AMERICAN CROSBY
Load-Rated! BLOCKS
Safe working capacity embossed on side plate
DISTRIBUTORS EVERYWHERE

AMERICAN HOIST & DERRICK CO.
ST. PAUL 1, MINNESOTA

CAN YOU AFFORD TO BE WITHOUT THE

Scintillometer

LOCATE URANIUM 100 TIMES EASIER. THE ONLY PORTABLE GAMMA RAY DETECTOR EMPLOYING CRYSTAL SCINTILLATION. DETECTS ALMOST 100% OF GAMMA RAYS IN COMPARISON TO LESS THAN 1% DETECTED BY THE GEIGER COUNTER.



PORTABLE OR AIRBORNE
ALL TYPES GEIGER COUNTERS;
SPECIAL LONG PROBE COUNTERS
FOR TESTING DRILL HOLES;
ULTRA VIOLET LIGHTS

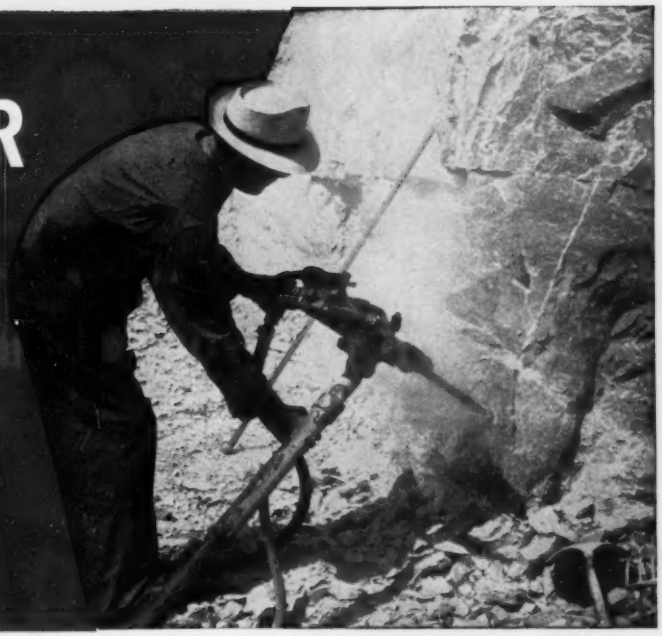
Engineers Syndicate, Ltd.
The House of Geiger Counters
5011 Hollywood Blvd.
Hollywood 27, California

The SINKER LEG with

EXCLUSIVE

EXCLUSIVE

EXCLUSIVE



Here's real savings in labor . . . man hours . . . and drilling costs . . . and 45% more drilling footage by actual tests!

The miner can carry the entire setup—Thor Sinker and Thor Leg—into the smallest tunnel or closest corner, set it up in an instant, start the hole . . . and then let Thor do the work! All he does is control the *constant pressure* feed by operating two simple throttles—*the only automatic controls in leg operation!*

Think of the savings . . . both in operating costs and air consumption. With carbide bits the Thor Leg can replace drifters—and heavy mountings on scores of heavy duty operations . . . can drift in tunnels where drifters won't fit. Write today for catalog data.

FULLY AUTOMATIC—A quick, easy setup—just start the hole—set the leg at any angle between 30 and 45 degrees . . . the leg does all the lifting—all the constant pressure feeding . . . control the feed with a turn of the wrist!

INDEPENDENT PNEUMATIC TOOL COMPANY

AURORA, ILLINOIS

Export Division: 330 West 42nd Street, New York 18, N. Y.

Birmingham Boston Buffalo Chicago Cincinnati Cleveland Denver
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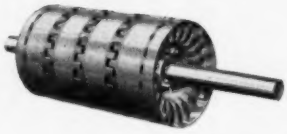
Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOL

Which Answers Your Tramp Iron Problem BEST?

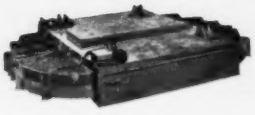
MAGNETIC PULLEYS?



Powerful, air cooled electro magnetic pulleys are ideal where well loaded conveyor belts are used. Installed as head drive pulley, tramp iron is discharged automatically. Low operating cost, long life and extreme power characterize this workhouse of the Dings line. Catalog C-1001A tells you why this magnet is exceptionally efficient.

Dings *non-electric, self-energized* Perma Pulley magnets are recommended where burden depths do not exceed 3". Within this range, these are the magnets to use because of their unsurpassed concentration of magnetic strength near the surface. Catalog C-1007A.

SUSPENDED RECTANGULARS?



Power close and power that searches down as deep as 30" to yank tramp iron out. If the Dings RM rectangular won't do it, it can't be done. Triple pole, double gap design. Install horizontally, vertically or at an angle above belt conveyors or in chutes. Self-cleaning fully automatic models also available. Write for details.

MAGNETIC DETECTOR?

The Dings Magnetic Detector instantly signals when any magnetic object large enough to be damaging passes through the detector zone. Can be hooked up to sound an alarm and stop the belt. Ideal protection for crushers, grinders, pulverizers, etc., where belt speeds are so excessive or burden depths so great no magnetic separator can fuction successfully. Detectors are available for belt widths from 18" to 72". Two types are available. One employs an electro magnet and the other, a permanent magnet. Performance of the two is comparable.

Magnets shown here are available in size ranges for most applications. Special magnets can be made for any application. Write today for recommendations.

DINGS MAGNETIC SEPARATOR CO.
4719 W. Electric Ave., Milwaukee 46, Wis.

Dings Certified MAGNETIC STRENGTH

4 BIG PRODUCERS FOR YOUR MINE!

WHERE big production talks, the LaPlant-Choate line of Motor Scrapers and Motor Wagons fill the bill. Money-saving interchangeability keeps your machines working and earning, and reduces your equipment investment on every job. In either the 200 or 300 size, you can use your LPC Tractor with its matching LPC Scraper to grade and surface haul roads, build truck turn-arounds, level building sites, move spoil banks, strip overburden, or for any earthmoving job where high speed, big capacity and big power are needed. The same Tractor coupled to a matched LPC Wagon gives you a fast, big-production hauling unit.

See your LaPlant-Choate distributor today for details about these production twins . . . let him tell you how to move more material at still lower cost.

2 TS 200 MOTOR SCRAPERS Grade for Railroad to Paradise Mine for

MULLIGAN BROS., INC.

GREENVILLE, KENTUCKY

FOR a small but important job, building this railroad grade to Paradise Coal Mine was no cinch! Mulligan Bros.' two TS 200 Motor Scrapers moved 50,000 yds. of the roughest kind of material . . . a mixture of clays, rock and sand, filled with roots. Working a steady, productive 10-hour shift each day, the TS 200's hauled 10 pay yards each trip over poor haul roads. Average loading time was 45 seconds. Dumping the roots and rock was no problem because of positive forced ejection plus the *extra* high apron lift. This is a typical example of Motor Scraper performance and dependability on machine-killing jobs.

LaPLANT-CHOATE TS 200 MOTOR SCRAPERS AND TR 200 REAR DUMP ROCK WAGONS

THE TS 200 Motor Scraper is a 10 to 13 yd. hydraulically controlled earthmover for your smaller jobs, yet has all the speed, power and capacity for high production on long haul jobs. Speed . . . over 21 mph; positive double-acting hydraulic steering and hydraulic operation of bowl and ejector for direct, instantaneous control; your choice of a 176 HP Buda or a 165 HP Cummins diesel, are but a few of the outstanding TS 200 features.

The 18-ton TR 200 is a hydraulically controlled rear dump rock wagon which can be used interchangeably with the S 200 Scraper. It tilts 70° from the horizontal and its stable wheel base and 4-wheel brakes assure absolute safety when dumping over the edge of a fill. Rock lug tires, a protected cab and full hydraulic control are included among the many efficiency features.

FOR YOUR BIGGEST JOBS!

TS 300 MOTOR SCRAPERS AND TW 300 MOTOR WAGONS

WHEN you have a big earthmoving job, you can depend on the high production advantages of the fast, powerful TS 300 Motor Scraper. Big capacity . . . 14-cu. yds. struck and 18-cu. yds. heaped. Speeds in excess of 22 mph. Big power . . . with your choice of either a 280 HP Buda or a 275 HP Cummins diesel.

The TW 300 is a hydraulically controlled bottom dump wagon which can be interchanged with the S 300 Scraper. 14- to 19-cu. yd. capacity, big 24:00 x 29 24-ply tires to carry heavy loads, double-acting hydraulic steering and hydraulic door control for effortless, trouble-free operation, large 4-wheel air brakes and many other money-saving features make this wagon outstanding in its field.

LaPLANT MANUFACTURING CO., INC. / **CHOATE** CEDAR RAPIDS, IOWA, U.S.A.

A Forecast by MARION

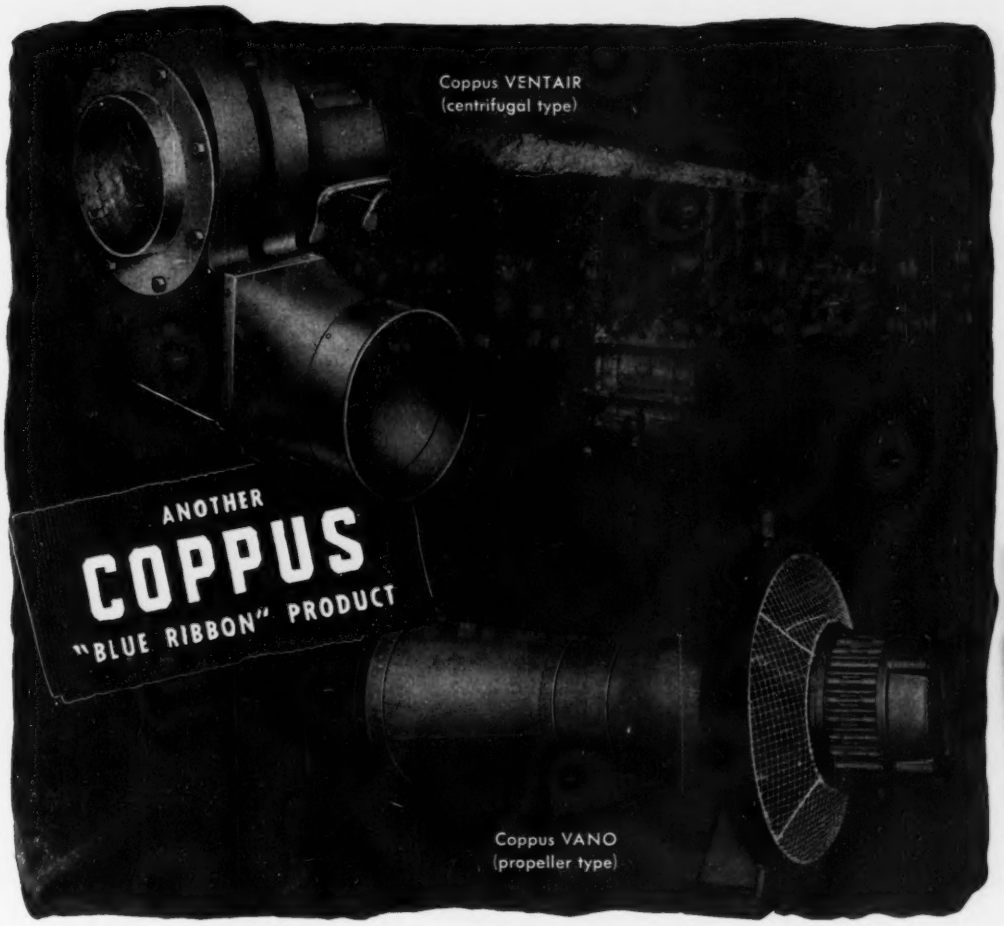
THIS NEW MARION 191-M . . . .

. . . . is the world's biggest loading shovel—the biggest two-belt crawler shovel built. It is shown at work loading stone for a big construction project in Kansas. The 191-M has loaded up to 1,600 yards an hour in big 10-yard bites that fill trucks in the 50-ton class in 3 passes.

MARION predicts the 191-M will have a bright and busy future in mining. For many reasons, it will have important applications in all kinds of open pit mining. Some of the reasons:

- 10 Cu. Yd. Standard Shovel with 43'8" Boom & 27'4" Handle
- 7 Cu. Yd. Long Range Shovel with 65' Boom & 40'4" Handle
- All-Electric or Diesel Electric Power, Ward-Leonard Control on Both
- An extremely Heavy-Duty Shovel with Small-Machine Cycle Time
- Greater Travel Speed and Maneuverability than most smaller machines

For more of the reasons, write, wire or phone Marion Power Shovel Co., Marion, Ohio. Since 1884. Offices in all Principal Cities.



Two Blowers . . . One Purpose: 30 to 100% More Air

Why two totally different blower types? Because the requirements of mine ventilation fall into two entirely different categories.

For high pressures, long pipe lines, use the Coppus VENTAIR (centrifugal type). For medium pressures, shorter pipe lines, the Coppus VANO (propeller type) is best. One or the other will give you more air per given power consumption than other blowers — from 30% to 100% more. Can be used as blowers or exhausters, capacities up to 90,000 CFM, with compressed air or electric motor drive.

Only Coppus makes both types. And, for quick recognition, each wears the famous "Blue Ribbon," distinguishing mark of top-quality engineering, materials and performance. This blue band is your guarantee of better mine ventilation . . . Look for it.

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corporation, 281 Park Ave., Worcester 2, Mass.

COPPUS ENGINEERING CORPORATION
287 Park Avenue, Worcester 2, Mass.

Please send: Bulletin 130.....

Name.....

Company .....

Address.....

FREE

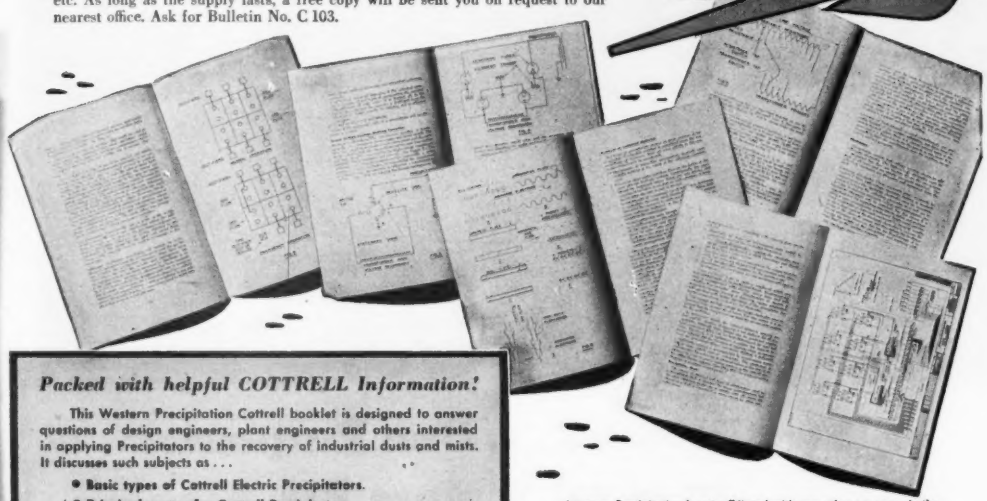
From Western Precipitation—the organization that pioneered the commercial application of Cottrell Precipitation...

IF YOU ARE ENGAGED in any phase of industry where the recovery of dusts, fumes, fly ash, mists, fogs or other suspensions from gases is a problem, you will find this booklet on the COTTRELL Electrical Precipitator helpful and informative.

Western Precipitation pioneered and installed the first commercial application of the well-known COTTRELL Electric Precipitator—Dr. Cottrell, the inventor, being a member of the company. And for more than 42 years Western Precipitation has consistently led in developing new COTTRELL advancements and techniques for recovering suspensions from gases, both wet and dry.

This 28 page booklet summarizes many of the basic facts you should know about modern COTTRELL Precipitators—the various types available, how they operate, principal types of electrode systems and rectifiers, shell constructions, etc. As long as the supply lasts, a free copy will be sent you on request to our nearest office. Ask for Bulletin No. C 103.

28 PAGES
of helpful facts to know about
COTTRELL ELECTRICAL PRECIPITATORS



Packed with helpful COTTRELL Information!

This Western Precipitation Cottrell booklet is designed to answer questions of design engineers, plant engineers and others interested in applying Precipitators to the recovery of industrial dusts and mists. It discusses such subjects as...

- **Basic types of Cottrell Electric Precipitators.**
- **Principal parts of a Cottrell Precipitator.**
- **Mechanical and Electronic Rectifiers.**
- **Various types of Collecting Electrodes (rod curtains, corrugated plates, dual plates, pocket electrodes, etc.).**
- **Removal of Collected Material.**
- **Factors in Shell Construction (steel, concrete, brick, etc.).**
- **Operating Efficiencies and the Effect of Various Factors on Performance.**

...and many other basic Cottrell facts. Write for your free copy of Bulletin C103 today while supplies are adequate!

Western Precipitation is not affiliated with any other company in the field of electrical precipitation except its wholly owned subsidiaries, International Precipitation Corporation and the Precipitation Company of Canada, Ltd. Whether you are now contemplating the installation of a Cottrell Electrical Precipitator, or may be interested in such an installation at a future date, we can and will serve you in any part of the United States or other countries.

NOW SELLING
COTTRELL Precipitators
MULTICLONE Collectors
TURBULAIRE Spray Dryers
...in all parts of the U. S. A. and foreign countries.

WESTERN Precipitation CORPORATION
ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS
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PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

TRACTION You can trust

4-wheel drive PAYLOADER®

It takes traction in all kinds of going to get jobs done on schedule . . . traction you can rely on the year 'round . . . that handles big loads quickly, easily and economically.

Hundreds of mines, quarries and pits use Model HM "PAY-LOADERS" . . . many have placed repeat orders proving their satisfaction with the traction, flotation and all-around utility of this unusual wheeled tractor-shovel. They also value its ability to get to the job and around the job fast . . . the way it can do so many jobs — dig, load big hauling units, strip overburden, do clean-up work, maintain haul roads, carry tools and equipment, do crane work, pull and push.

Operators like its ease of operation, thanks to power-boosted steering, fingertip hydraulic control, the quick, easy shift between the four forward speeds and four reverse speeds. Once you see the Model HM "PAYLOADER" in action you'll want one too, so see your "PAYLOADER" Distributor or write The Frank G. Hough Co., 726 Sunnyside Avenue, Libertyville, Illinois.

WRITE for catalog on the 1½ yd. Model HM or the six other "PAYLOADER" sizes down to 12 cu. ft. bucket capacity.

PAYLOADER®

air DOES THE WORK

ON THE LORAIN 50 I-K-S MODELS

Here's another *big* reason Lorain-50's, models I, K & S, are so outstanding in the 1-yd. class! When Air goes to work on a "50", your operator just can't help but give you more yards-per-hour; more profit-per-day. Why? Because he's benefiting from these important operating advantages . . .

HOIST — Air-Assist — *allows the operator to retain that important finger-tip, sensitive "feel" of just what his machine is doing.**

CROWD — Air-Assist — *requires less manual effort from the operator; reduces operator fatigue; Air keeps the crowd clutch applying digging power until the dipper breaks out of the bank.**

RETRACT — Air-Assist — *levers must be moved shorter distances — with reduced effort, to maintain clutch application.**

CRAWLER STEERING AND TREAD-LOCK OPERATION — Air-Controls — *Air makes it faster and easier to steer the Crawler—or set the Tread Locking Pawls — from the operator's station, regardless of the Turntable swing position.*

STAND-BY CONTROLS — *All Air Controls are equipped for quick switch-over to straight, manual, mechanical operation in cases of emergencies. Immediate take-over; no adjustment; no loss of time.*

* All these features apply to the Air-Assist control of Hoist, Crowd, Drag-in and Retract.

THE THEW SHOVEL CO. LORAIN, OHIO

PLUS HYDRAULIC COUPLING

In addition to this improved operation, Lorain "50's" give you the Hydraulic Coupling with its no-engine stall, shock-proof performance. The "50" is your combination for "easiest" and "smoothest".

THEW **LORAIN**® on CRAWLER or RUBBER

SHOVELS
CRANES
DRAGLINES
CLAMSHELLS
HOES

. . . and another

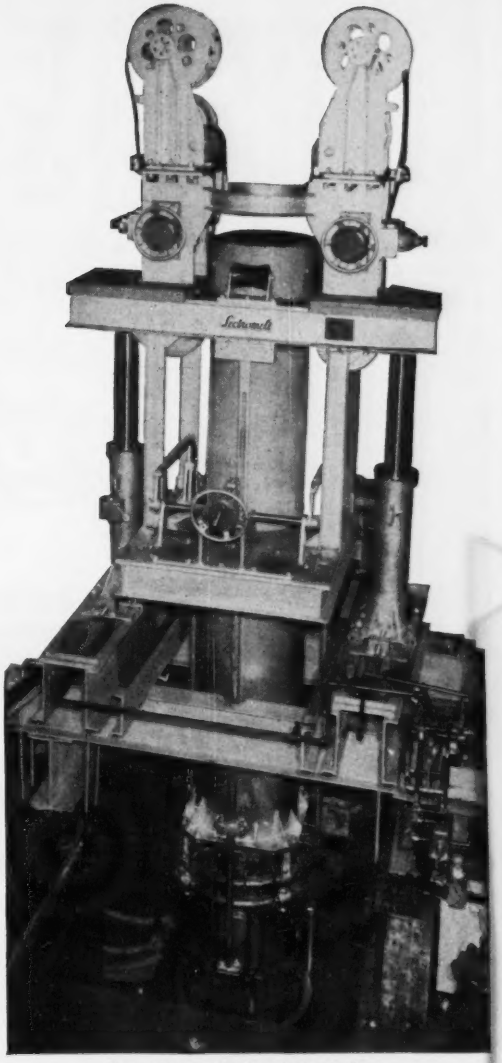
*Lectromelt**

Smelter is on its way

Lectromelt self-baking electrodes offer these typical advantages:

1. The complete structure is supported on two I-beams just above the furnace roof, resulting in lower and lighter building construction above.
2. No movable parts required at clamp level such as bolts, nuts, springs, etc., which can be damaged by flame.
3. Remote-control clamping device allowing for quick and simple electrode adjustment and easy replacement of clamp shoes.
4. Pressure ring exerts uniform pressure and holds electrode circular.
5. Four cable supports providing minimum distortion of casing at clamp.

For a further listing of advantages of Lectromelt self-baking electrodes and more data on the above, write Pittsburgh Lectromelt Furnace Corporation, 322 32nd St., Pittsburgh 30, Pa.



One of three self-baking electrodes for a ferromanganese smelting furnace on Lectromelt's erection floor; testing is completed and ready for shipment.

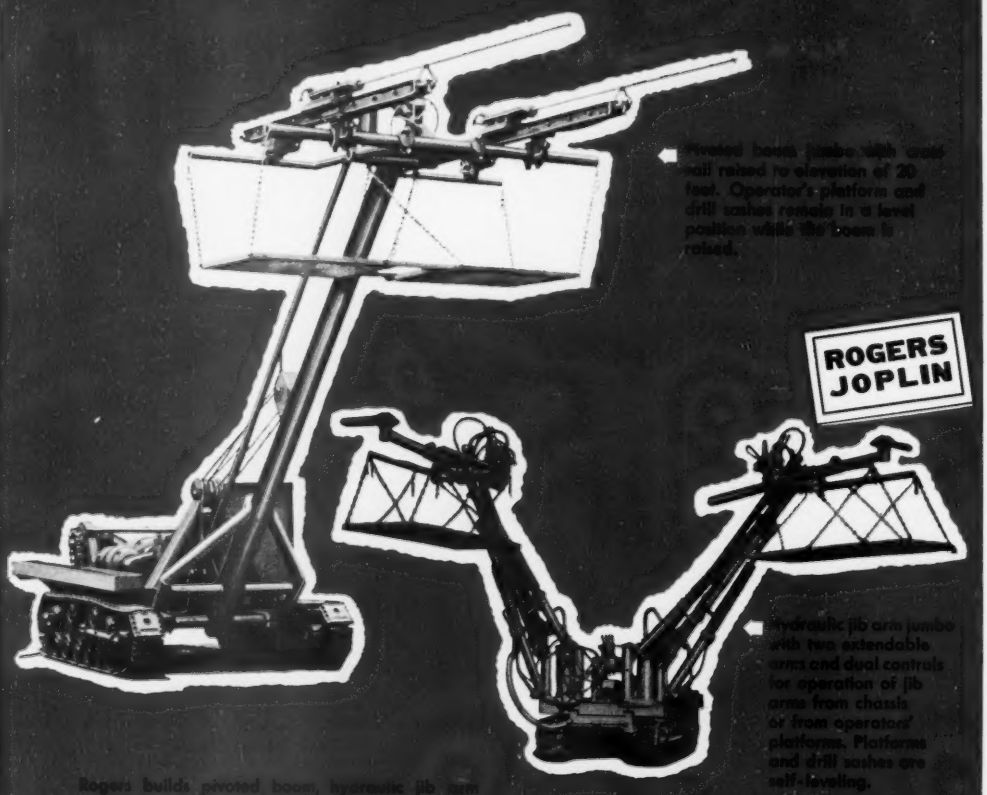
Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . AUSTRALIA: Birlec, Ltd., Sydney . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa.

*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID *Lectromelt*

ROGERS JUMBO

FOR DRILLING • POWDER LOADING
SCALING • ROOF BOLTING • TIMBERING



Pivoted boom jumbo with quad rail raised to elevation of 20 feet. Operator's platform and drill sashes remain in a level position while the boom is raised.

Hydraulic jib arm jumbo with two extendable arms and dual controls for operation of jib arms from chassis or from operators' platforms. Platforms and drill sashes are self-leveling.

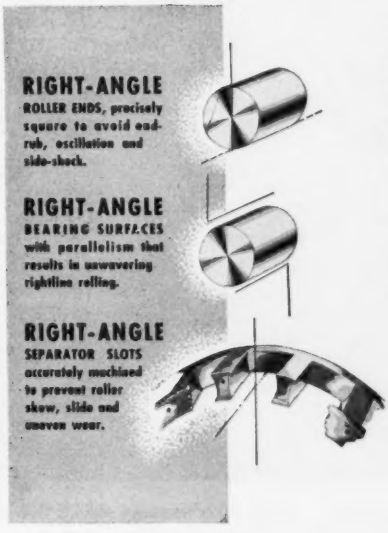
Rogers builds pivoted boom, hydraulic jib arm and vertical mast jumbos, custom designed to meet a wide variety of underground conditions. Many users report from 50 to 100 per cent additional footage drilled per shift at a negligible cost for jumbo operation. Write for additional literature.

ROGERS IRON WORKS CO.
Joplin, Missouri

OTHER ROGERS EQUIPMENT:

- Apron Feeders
- Reciprocating Feeders
- Conveyors
- Drill Jumbos
- Portable Crushing Plants
- Mine Hoists
- Rock and Ore Washers
- Revolving Screens
- Vibrating Screens
- Live Roll Grizzlys
- Underground Loaders
- Elevators

Severe Shock Loads With Stress in One Direction


RIGHT-ANGLE
ROLLER ENDS, precisely square to avoid end-rub, oscillation and side-shock.
RIGHT-ANGLE
BEARING SURFACES with parallelism that results in unwavering rightline rolling.
RIGHT-ANGLE
SEPARATOR SLOTS accurately machined to prevent roller skew, slide and uneven wear.

• Drop forges, various types of presses, headers, breakers and crushing machinery impose shock loads in one direction, severely testing the capacity of a bearing to resist fatigue and permanent set. Rollway Solid Cylindrical Roller Bearings afford the elastic limits and the high fatigue values to take these highly localized stresses in stride.

That's because Rollways are *made right*. They provide more metal to carry the load . . . maintain long line contact with the race.

Right-angle loading reduces unit pressures. Right-angle trueness reduces wear, heat, noise.

Our Complete engineering and metallurgical services will gladly work with you on your problems. Simply write or wire any sales office. No cost. No obligation.

Rollway Bearing replacements are available through Authorized Bearing Distributors in principal cities. Consult your classified 'phone directory. Rollway Bearing Co., Inc., Syracuse N. Y.

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ROLLWAY BEARINGS

Complete Line of Radial and Thrust Cylindrical Roller Bearings

AMSCO MANGANESE STEEL WELDMENTS
ADD NEW LIFE TO WORN EQUIPMENT

Amsco Welding Rods and Electrodes For repair welding of manganese steel shapes to worn equipment, American Manganese Steel Electrodes retain their toughness and give real operating savings.

Amscoating with Amsco Hardfacing Rods increases service life . . . reduces shutdowns.

Contact your Amsco Distributor or write for illustrated catalog WA-77 on Amsco Manganese Steel Weldments and Hardfacing Selector Guide.

Brake Shoe | **AMERICAN MANGANESE STEEL DIVISION**
376 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que.
Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

BIG

Plenty ...and ACCURATE, too

from PHILLIE GEAR

When you need big gears like the helical gear shown here it will pay you to order from Phillie Gear. We have the engineering know-how gained through 60 years of gear making plus modern plant facilities for producing them to your most rigid requirements.

From designing to finishing each step is under our close control to assure the high quality and precision of every gear. Exacting inspections make certain that the gear is accurate to your specifications.

Philadelphia makes spur and helical gears up to 150 inch diameter, 48 inch face; Worm gears up to 150 inch diameter; Continuous tooth herringbone gears up to 60 inch diameter, 18 inch face; bevel gears up to 96 inch diameter.

OUR 60TH ANNIVERSARY

More details are in our Gear Catalog #48. Write for a copy on your business letterhead.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

BROWNHOIST

BUILDS BETTER BULK MATERIALS HANDLING EQUIPMENT

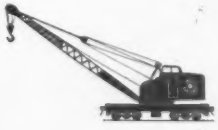
For over three quarters of a century Brownhoist has engineered, designed and built boat unloaders, storage bridges, cranes and car dumpers for efficient handling of coal, ore and other bulk materials in practically every corner of the world.

Railroads, steel mills and dock operators interested in machinery for handling ore, coal or other bulk materials will find that it pays to discuss their requirements with Brownhoist engineers.

Brownhoist equipment includes unloaders, fast plants, traveling bridge cranes, Diesel and Diesel Electric locomotive cranes, clamshell buckets, car dumpers, car pushers, shipyard cranes, and related machinery.

BROWNHOIST BUILDS BETTER CRANES

160

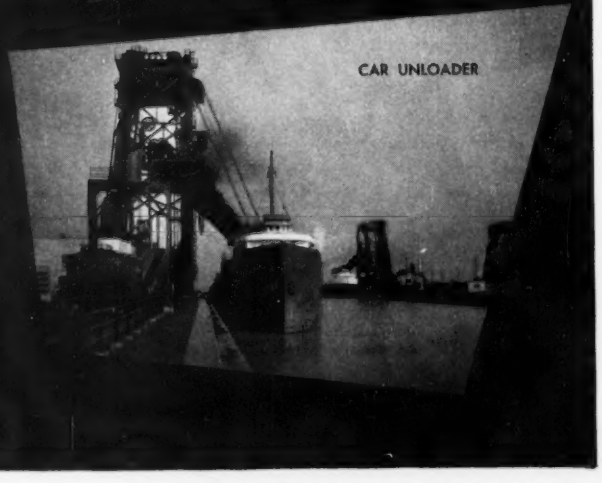


INDUSTRIAL BROWNHOIST CORPORATION
BAY CITY, MICHIGAN

DISTRICT OFFICES: New York, Philadelphia, Cleveland, San Francisco, Chicago, Canadian Brownhoist, Ltd., Montreal, Quebec • **AGENCIES:** Detroit, Birmingham, Houston, Los Angeles

COAL AND ORE BRIDGE

TRAVELING CRANE



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LE-HI Makes a Good Connection TOO!

Specify LE-HI for all Hose Couplings!

Wherever hose is used there is a LE-HI hose coupling to match—from small tubing to large industrial applications.... The complete LE-HI line includes:

- Air Tool Couplings
- Welding Hose Couplings
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SERIES 400

SERIES 650

- Drilling Hose Couplings
- Oil and Gas Hose Couplings
- Agricultural Hose Couplings

. . . plus complete lines of hose clamps, air valves and manifolds.

Sold through leading distributors and rubber manufacturers only.

"Old Doc" says: "Write now for your free copy of the complete LE-HI catalog"

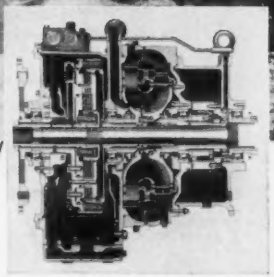
HOSE ACCESSORIES COMPANY
1718 Lehigh Ave.
Philadelphia, Pa.

LE-HI Makes a Good Connection!

LE-HI
HIGH and LOW PRESSURE
HOSE COUPLINGS
TRADEMARK REGISTERED

Not nearly so tough

with a TWIN DISC TORQUE CONVERTER



Have you heard what Bagdad Copper Corporation is reporting on its Buda-powered Dart Trucks in which the power is put to work through the *new* Twin Disc DF Hydraulic Torque Converters?

"The trucks negotiate the steep grades fully loaded and *without ever shifting* gears . . ."

"They return down grade *without using the brakes* . . ."

"Total maintenance and repair costs may be *less than 2 cents per ton*... far less maintenance than ever before . . ."

"Fuel costs per ton of ore hauled with the torque converter have *decreased instead of increasing* as was presumed."

The Twin Disc Model DF is a three-stage hydraulic torque converter with built-in converter braking feature which not only eliminates gearshift guesswork on grades but also, combined with engine drag, can perform 90% or more of the braking. The records the DF is setting are amazing. Write today for details. You may be able to save hundreds of dollars per unit in maintenance savings and faster round trips.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin — HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

Important facts about pH for MINING & MILL OPERATORS

WHETHER you are building a new plant or modernizing present equipment, one of the most important advancements you can make is the installation of BECKMAN pH CONTROL. Throughout the mining industry—in gold, tin, tungsten, lead, zinc, copper and many other flotation operations—Beckman pH Control is proving to be the key to much higher recoveries, better control of processes, lower labor and chemical costs. Result—substantially greater profits per ton of ore. Some of the many benefits resulting from Beckman pH Control include . . .

- greater speed, convenience and accuracy in laboratory leaching or flotation tests.
- opportunity for centralized or automatic, control of multiple flotation circuits.
- reduction of corrosion and scaling in pipe lines.
- improved or automatic, control of electrolytic operations.
- *and many other vital savings in mining and mill operations—savings that will quickly pay for the installation, and will continue producing extra profits year after year!*

For helpful details on mining applications, write to Data File 5-27.

TO MAKE CERTAIN you get the latest, most convenient and most accurate pH equipment, be sure to specify "BECKMAN" . . .

* Beckman pH equipment is completely electrometric, eliminating the mess and inaccuracies of colorimetric methods. Simply press a button and the exact pH of any process is instantly shown on a large easily-read dial. *It is the simplest of all pH methods!*

* With Beckman equipment no time-wasting or troublesome sampling devices are needed. Beckman pH electrodes may be installed directly in vats, tanks, channels or flow lines—and exact pH values read instantly—and *continuously*, if desired—on the process fluids themselves.

* The accuracy of Beckman pH readings is completely unaffected by human errors in color judgment, by turbidity, oxidizing or reducing agents, by suspended materials, colored process solutions or other variables that affect outmoded colorimetric methods. *Beckman pH readings are universally accurate and dependable!*

* Unique rugged-type Beckman Electrodes, especially designed for direct immersion in abrasive or suspension-laden fluids, reduce maintenance to an absolute minimum. *Beckman is the most trouble-free of all pH equipment!*

The above are only a few of many Beckman advantages. Write for the complete story.

There's a Beckman pH Instrument to meet your needs!

COMPLETELY AUTOMATIC! The Beckman Model R instrument operates directly from standard 110 v. A.C. lines to provide completely automatic pH indication. Also provides for completely automatic pH recording and automatic process control. Can be installed to give accurate pH readings from various stations in plant through one instrument. *This is the pH unit being installed by today's most modern plants, large and small.*

PORTABLE A.C. OPERATION! The Beckman Model H instrument can be quickly moved from one part of the plant to another and plugs directly into standard 110 v A.C. current. Compact, convenient and extremely simple to operate, the Model H gives *instant* pH readings on an easily-read dial. Widely used both for manual pH control of small plants and as an auxiliary instrument on completely automatic pH installations.

COMPLETELY SELF-CONTAINED! The Beckman Model N is the ideal instrument where *complete* portability is desired. Operating from its own self-contained, long-life power supply, the Model N can be used *anywhere*—in plant, field or laboratory—without dependence on A. C. power circuits. Features maximum compactness, simplicity and operating convenience, coupled with extreme ruggedness. Available in two types . . . the N-1 with separate Buffer, KCl solution and beaker . . . the N-2 with integral case for Buffer, KCl solution, beaker, thermometer, etc.

BRING YOUR pH PROBLEM TO US. Our trained engineers will gladly study your problem and recommend the equipment best suited to your particular requirements. No obligation, of course.

Write for literature on Beckman pH Equipment!

BECKMAN INSTRUMENTS INC

SOUTH PASADENA 27, CALIFORNIA

Factory Service Branches: Chicago • New York • Los Angeles

Beckman Instruments include: pH Meters and Electrodes—Spectrophotometers—Radioactivity Meters—Special Instruments

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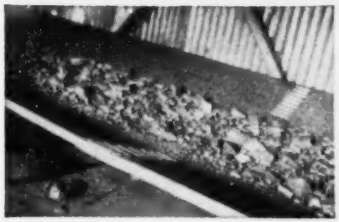
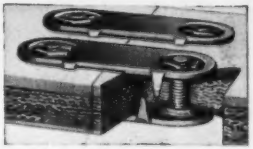
BELT FASTENERS and RIP PLATES



FOR HEAVY CONVEYOR AND ELEVATOR BELTS OF ANY WIDTH



Compression Grip distributes strain over whole plate area

★ FLEXCO Fasteners make tight butt joints of great strength and durability.
★ Trough naturally, operate smoothly through take-up pulleys.
★ Distribute pull or tension uniformly.
★ Made of Steel, Monel, Stainless, Everdur. Also Promal top plates.
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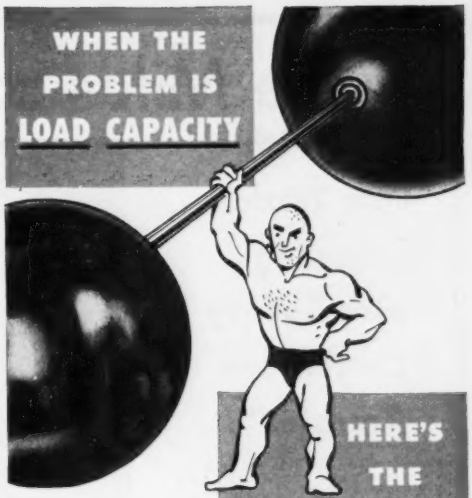
WHEN THE PROBLEM IS LOAD CAPACITY



HERE'S THE ANSWER

Tough jobs, rough jobs, dirty jobs . . . where ordinary bearings fail . . . Shafers take over. Shafer ConCaVex bearings are "ruggedized" throughout—in design, construction and functional capacity. Their reserve strength has paced the needs of every heavy industry for the past third century. Try them in the equipment you make or use —for longer life, greater dependability, less attention, better, faster, easier installation and adjustment. Ask for descriptive literature and engineering assistance. No obligation.

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SELF-ALIGNING
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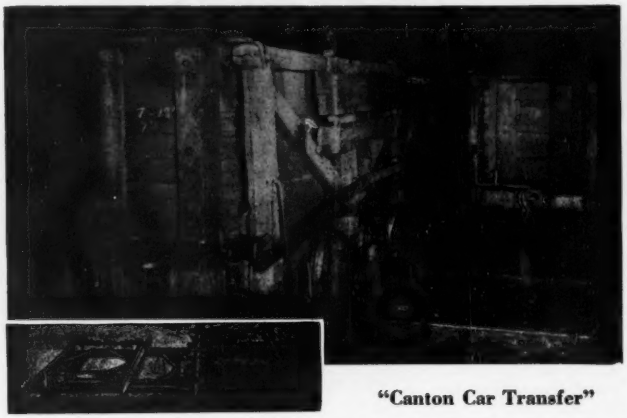
INDUSTRIAL • AIRCRAFT

Save Miles of Tunneling . . .

Save with One Track Tunneling with Speedy "Canton Car Transfer"



"Canton Car Transfer"

No need to dig and take out twice the width of a tunnel when a single track will do the job more economically . . . loads entire train on the single track. This famous economy device can be installed on any track of gauge and rail now in use. Its operation is simplicity itself . . . pushing empty car on track by locomotive then moved by hand to transfer section, permitting locomotive and cars to pass. Train is pulled out all at one time. Two men in two minutes can take down, to move the three units to new location when desired . . . no alterations required for track or rails. Timken Roller Bearings enable easy shunting of heavy cars to maximum weight of six tons. The Car Transfer speeds up loading, hauling, saves expensive double-tracking. Write for complete literature; please use street and zone numbers.

American Mine Door Co.

2039 Dueber Avenue
Canton 6, Ohio

Manufacturers of "Dustributors" • Automatic Switch Throwers • Automatic Mine Doors • Mechanical Track Cleaners

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Really Cleans Shower Stalls

—where ordinary cleaners and hard rubbing fail

"Bull Frog"
SAF-T-KLENZ

Removes rust stains, lime deposits, soap, oil, body grease and algae formation. Practically slip-proof. Minimizes conditions that breed and spread infectious germs. Simply sprinkle Saf-T-Klenz powder on damp surface, mop lightly and flush with clear water. Harmless to hands, clothing, floor, drains. Odorless.

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that other readers of this paper can supply

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SOLVE ANY GRINDING PROBLEM with a RIB-CONE MILL

40 years of experience in supplying every conceivable grinding requirement is at your disposal in the form of engineering counsel. An inquiry to our engineering department will bring a prompt reply.

STRAUB MFG. CO.

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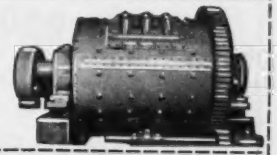
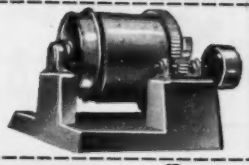
SECTIONALIZED MILL

Completely assembled in our shop, then marked and knocked down for shipping "Anywhere a Mule Can Go."



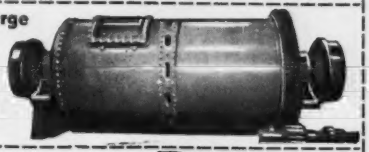
SCREENING MILL

Most economical type. Particularly suited to amalgamating and concentrating classes of ores. Capacity from 2 to 95 tons per 24 hours.



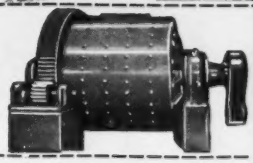
Peripheral Discharge MILL

Particularly suitable for producing a granular product. Designed for controlled grinding of tungsten and similar ores where sliming must be eliminated.



LOW PULP LINE MILL

One of the new Champion Series. Available in low pulp line, plain overflow, screening and convertible types with capacities ranging from 25 to 250 tons per 24 hours.



★ More than 100 Sizes and Types of RIB-CONE Ball Mills.

His business paper . . . of course

No man who takes his job seriously takes his business paper lightly. The **Best Informed Men in your Field** read every issue . . . straight through. They can't afford not to. Matter of fact, who can? You *need* the continuous touch with facts, news and "how-to" that only your business paper provides. Cover-to-cover reading makes *you* one of the **Best Informed Men in your field,** too.

Engineering & Mining Journal

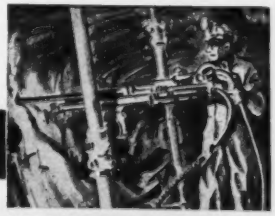
One of a series of ads prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

He's getting out more ore . . .

ARE YOU?

He's using carbide Rok-Bits . . .

JOIN HIM!

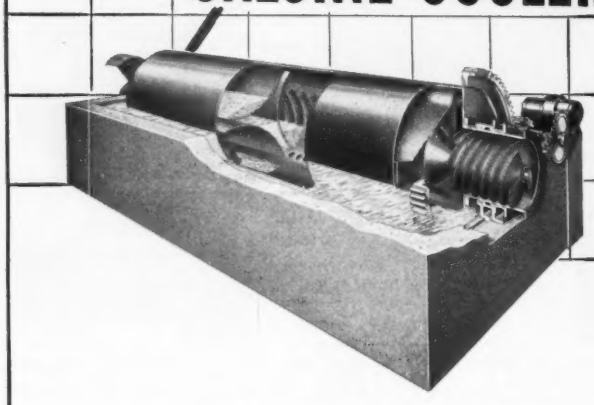


TO meet today's demands for greater ore tonnage, supply your drillers with carbide Rok-Bits. They drill faster—cut bit cost—produce single gage holes, reduce air consumption, practically eliminate bit changes. Why buck the carbide drilling tide, ride it to greater profits. Write! Rock Bit Sales & Service Co., 2514 E. Cumberland St., Philadelphia 25, Pa. — 350 Depot St., Asheville, N. C.

ROCKBIT
SALES AND SERVICE CO.

CARBIDE ROK-BITS • INTRA-SET DRILL STEEL
LONG HOLE DRILLING TOOLS • HOLE-SAVER
ALL TYPES OF HOLLOW DRILL STEEL

SPEED UP PRODUCTION... SAVE FLOOR SPACE AND DRIVE-POWER WITH THE IMPROVED CALCINE COOLER



Designed for maximum efficiency, the Stearns-Roger Improved Calcine Cooler handles large tonnages of hot material with a minimum of shell length, resulting in a corresponding saving in floor space.

The inside of the Improved Cooler shell is divided into three sections. Holes in the outer shell allow free access of water between each of these sections thereby ***approximately doubling the cooling surface*** provided by a cylindrical section.

For specifications write for the Calcine Cooler Bulletin.

- **BUILDERS**
- **DESIGNERS**
- **MANUFACTURERS**

For The Mining and Process Industries

Stearns-Roger

THE STEARNS-ROGER MFG. CO. DENVER COLORADO

F-12A

IF IT'S

here...

IT'S # news...

IT'S WORTH STOPPING TO SEE!

Maybe Industry doesn't maintain show windows on Fifth Avenue or State Street or Wilshire Boulevard like America's great department stores. But your industry has a mighty effective show window... *and this is it*... this magazine. In these advertising pages alert manufacturers show their wares. Here you will find up-to-the-minute news about products and services designed to help you do your job better, quicker, and cheaper.
To be well-informed about the latest developments in *your* business, *your* industry... and to stay well-informed... *read all the ads too.*

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How to read with your eyes open for business!

Read the ads! Every issue of this magazine contains ads that offer valuable services and useful products by which your business may be run more profitably.

The time it takes to read all the ads is time well spent. One ad alone can pay off – by informing you of new developments and new sources of supply, by helping you do a more efficient job. For example, you may locate one machine that will cut your production costs, or step up your output. Or you may discover that the equipment you've been waiting for is now available.

This magazine displays more ideas and merchandise than a trade exposition. Make every issue your buyer's guide. Read the ads as well as the articles. That's reading with your eyes open for business.

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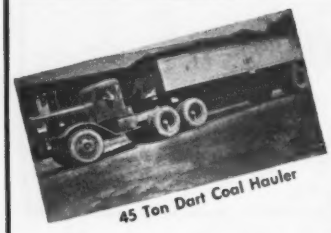
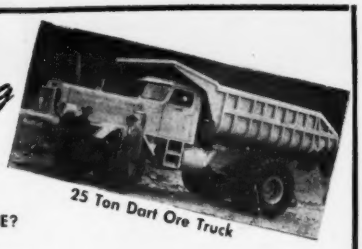
This comprehensive 28-page catalog is yours for the asking. For complete information about Collyer Portable Power Cables — and new Bulletin 151 — write Collyer Insulated Wire Company, 245 Roosevelt Ave., Pawtucket, Rhode Island.

CHOOSE Collyer CABLES

Pioneers In Truck Engineering Since 1910



45 Ton Dart Coal Hauler



25 Ton Dart Ore Truck

REMEMBER WAY BACK WHEN
TRUCKS DIDN'T HAVE SOME OF THESE?

TOROMATIC TRANSMISSIONS
8 CYLINDER DIESEL TRUCK ENGINES
BUTANE AND PROPANE TRUCK ENGINES
FLUID CLUTCH COUPLINGS

TORQUE CONVERTERS
TWIN ENGINES

1910 ½-Ton Dart

TUBULAR FRONT AXLES
BOX GIRDER FRAMES
12 CYLINDER DIESEL TRUCK ENGINES
HYDRAULIC STEERING

DART *Pioneered Them*

We are proud of our reputation that we build trucks to incorporate the features our customers WANT and NEED
Successfully hauling loads of 10 to 70 tons for the mining industry.

DART TONNAGE ENGINEERED TRUCKS

DART TRUCK CO. KANSAS CITY 8, MISSOURI

OVER 40 YEARS EXPERIENCE IN BUILDING SPECIALLY ENGINEERED TRUCKS

Users praise
ANTON SMIT BITS
in these
***volunteered* reports:**

- They have *out-performed* the – –and– –bits.
- The heads of Anton Smit bits do not come off!
- An improvement over the other impregnated bit we tried.
- . . . the best bits used thus far on our drilling at – –
- Cut the *highest footage* obtained by any bit on this job!
- Our records indicate a pretty good margin in favor of your bits.
- The first Ascolite bit you sent me worked fine . . . please send me six more . . .
- . . . greatly pleased . . . find them more serviceable than other pre-set bits tried.
- . . . drilled over 500 feet in ground where the average for hand-set bits is 110 feet . . .
- The bits were . . . unusually satisfactory and it is desired to obtain four new bits like them.
- . . . shows a considerable saving . . . over our own cast-set bit . . . we wish to have four more made up.
- *The letters containing the above comments are on file in our New York Office.*

Est. 1908 **ANTON Smit & CO., Inc.**

Importers and Dealers • Carbons, Bortz, Ballas
Manufacturers of Diamond Tools
333 W. 52nd St., New York 19, N. Y. Cables: PROFITABLE, New York

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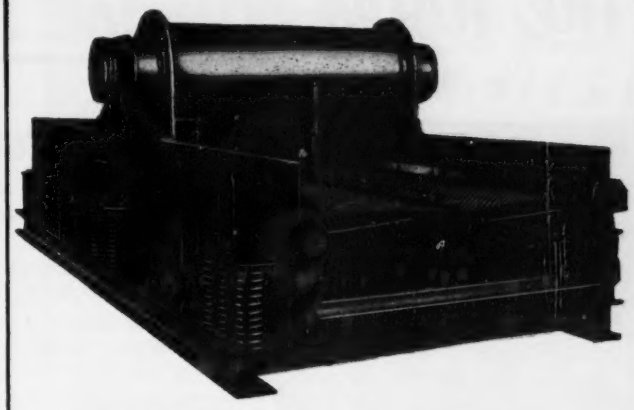
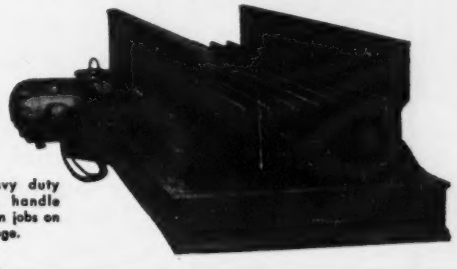
748 FULHAM ROAD, LONDON, S.W.6, ENGLAND
CABLES: BOILASETTA, WALGREEN, LONDON



SIMPLICITY gyrating screens are doing a fast, efficient sizing and dewatering job for the metal mining industry

The 6' x 20' Simplicity Model OM Double Deck Screen shown here is typical of Simplicity Screens used successfully at the great Mesabi Range in Minnesota to size and dewater iron ore. This screen, with a ⅜" opening on the top deck and a 1½mm. dewatering surface on the lower deck, is designed for heavy media concentration of iron ore.

Throughout the metal mining industry, Simplicity equipment is handling all types of preparation work from coarse scalping to fine screening and dewatering. Simplicity operating mechanism insures fast, accurate sizing and keeps production costs down.



Simplicity heavy duty scalpers also handle tough production jobs on the Mesabi Range.

Simplicity
TRADE MARK REGISTERED

ENGINEERING CO. • DURAND, MICHIGAN

Sales representatives in all parts of the U.S.A.
FOR CANADA: Canadian Bridge Engineering Co., Ltd., Walkerville, Ontario
FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, N. Y.

113

The holes cannot stretch—

in Hendrick Perforated Metal Screens

On vibrating and shaking screens Hendrick Perforated Metal Plate maintains its uniformity of mesh throughout an unrivaled length of service life.

When it is to be used for screening especially abrasive material, the plate is heat-treated to increase its toughness.

The full clearance of Hendrick Perforated Plate practically obviates clogging. Another time-saving and cost-reducing feature is the ease and rapidity with which decks can be changed.

Write for a copy of the Hendrick Perforated Plate Catalogue, which lists fifteen hundred regular combinations of shapes and sizes of perforations in which Hendrick Perforated Plate can be furnished.

SEE OUR CATALOG IN SWEET'S

HENDRICK

Manufacturing Company

70 DUNDAFF STREET, CARBONDALE, PENNA.

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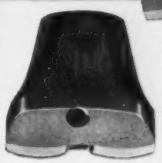

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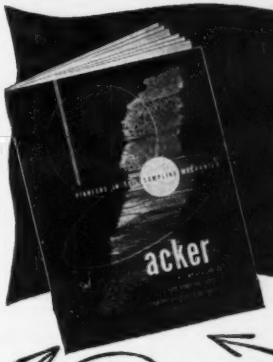

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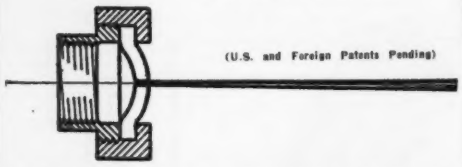

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(Continued on opposite page)

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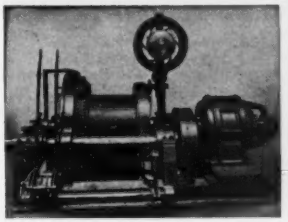

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(Continued from opposite page)

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14"	4	1/16"	1/32"	28 Oz.
16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
36"	6	1/8"	1/16"	32 Oz.
42"	5	1/8"	1/16"	32 Oz.
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1—2-cell #15 Denver "Sub-A" Flot Wood Tank
1—8-cell #24 Denver "Sub-A" Flot Wood Tank

PUMPS — SAND
1—2" Wilfley with 5 HP AC Motor
1—3" Wilfley with 10 HP AC Motor

HOISTS — AIR
1—5 HP Sullivan Turbinair 2-drum Slusher Hoist with scraper bucket
1—Leadville Sgl. Drum, 1000# rope pull

CRUSHERS — JAW
1—6 x 12 Wheeling
1—10 x 20 Allis-Chalmers, Blake Type
1—9 x 40 Austin-Western

CONVEYORS
1—18" x 35' Long, complete with belt and motor
1—14" x 11' Long, Belt Feeder, on steel channels

BALL MILLS
1—#64 Marcy
1—30" x 48" Baker

MISCELLANEOUS
1—15 HP Box Slg. Drum Geared Hoist with motor
1—20' x 10' Thickener
1—2" Jaeger Gasoline Driven Pump on solid rubber tires
1—32" x 16" Davis Crushing Roll
1—3200' Aerial Tram
1—750' Jig-back Tram
1—Jeffrey Dry Reagent Feeder, Vib. Type
1—18" Denver Cone Type Dry Reagent Feeder
1—12" Jeffrey Blower Fan
1—50 Ton Maurer Truck Scale, steel I Beam Stringers
1—#24A Humphrey Spiral with rack
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Enclosed Safety Switches, 30 to 200 amp.
1—30" x 8' Air Receiver
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COMPRESSORS: Worthington DC2, 29/18-1/2 x 21, motor 600 H.P. synchronous, 440 volt, with all auxiliary equipment. 2—Ingersoll Rand Model XVH, 200 H.P., 2200 volt, complete, NEW condition.

MOTORS: 2—NEW G.E., Tri-clad, drip proof, 1000 H.P., 1800 RPM, 2300 volt, with automatic controls.

CRUSHERS, JAW: Sizes 12" x 15" to 48" x 60".

CRUSHER, ROLL: Traylor 18 x 42", heavy duty.

CRUSHER, GYRATORY: Telsmith 10-B, all steel, opening 10 x 74", 75 H.P. motor, V-belt.

CRUSHERS, REDUCTION: Symons 3 ft., 4 ft. and 5½ ft. with short head and fine bowl, with motor and drive. Symons 2 ft. with coarse bowl. Telsmith 13" and one 10" with motors and drives.

DRYERS or KILNS: 2—10 ft. x 90 ft. heavy duty, with or without auxiliary equipment, condition like NEW. Located Minnesota. 1—10 ft. x 25 ft. and 1—5 ft. x 50 ft.

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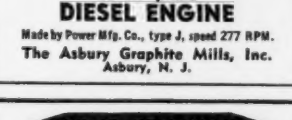

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Dry Rolling Toggle

with Rockin' Chair Motion

A-1 Jaw Crushers

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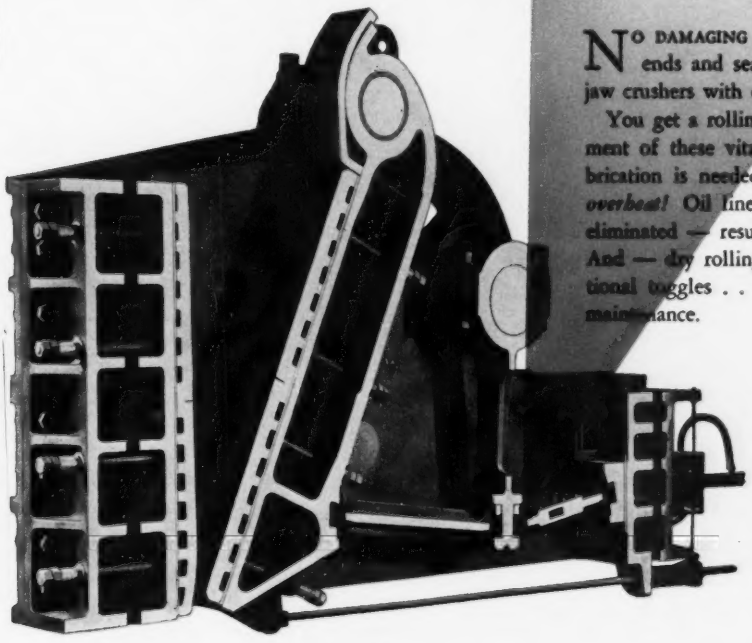
No Lubrication Needed



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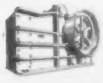
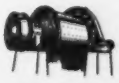


Jaw Crushers

Gyratory Crushers



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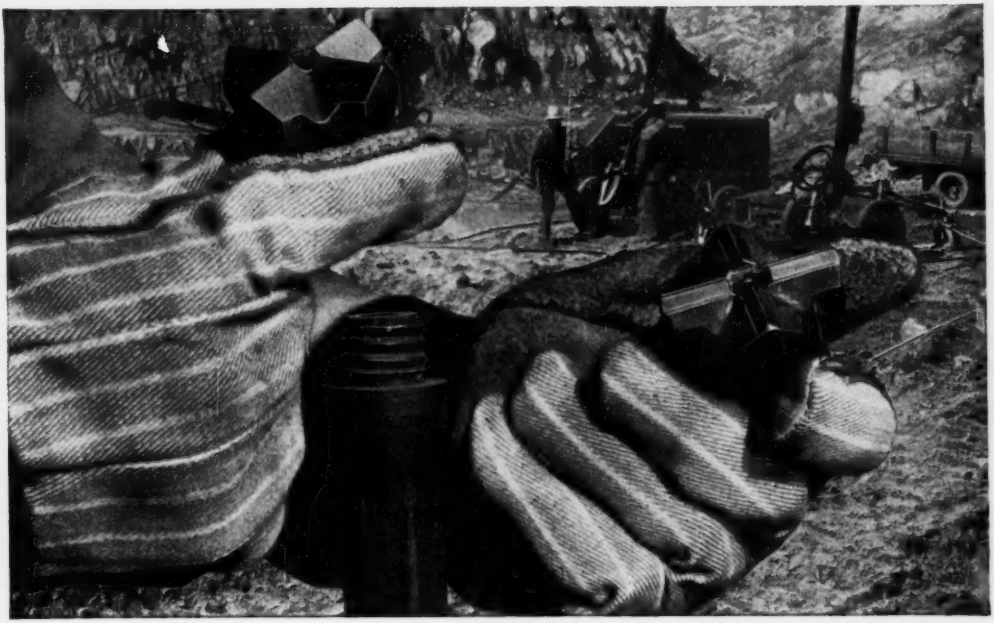

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